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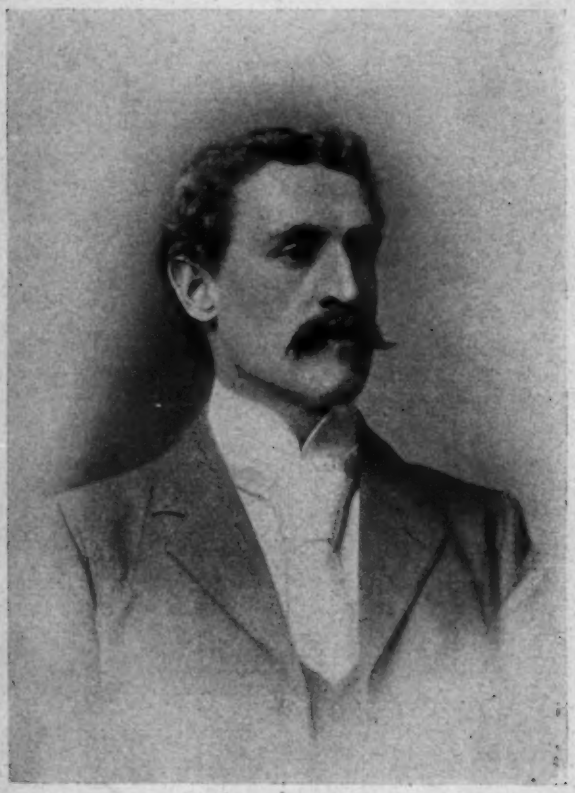

Photograph by] MR. ALFRED FLAVELL. [W. Wollaston

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FOR THE SCHOOL-ROOM AND THE STUDY

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EDUCATION IN PARLIAMENT—AUGUST.

LET me carry on the abstract and brief chronicle of the Education Bill's fortunes from the point where I left the subject in my last article. That point was the nullification and withdrawal of Clause 5. The local option as to controlling elementary education being gone, Clause 5 was no longer required.

The history of Clause 6 is written in the two forms given below. The first form is as the clause appeared in the Bill; the second is as it passed Committee. I italicise words that were used in the alteration.

First form:—

"6. The local education authority shall throughout their area have the powers and duties of a school board and school attendance committee under the Elementary Education Acts, 1870 to 1900, and the control of all secular instruction in public elementary schools, whether provided by them or not, and school boards and school attendance committees shall be abolished in that area."

Last form:—

"6. The local education authority shall throughout their area have the powers and duties of a school board and school attendance committee under the Elementary Education Acts, 1870 to 1900, *and any other Acts, including local Acts, and shall be responsible for and have* the control of all secular instruction in public elementary schools, *not provided by them*, and school boards and school attendance committees shall be abolished."

Clause 7 has had a checkered career. Hardly had it begun to be discussed when Mr. Balfour perceived that the whole question of the management of schools—provided schools and aided schools—was likely to be debated on this clause, although the question of the management of denominational schools arises more properly and fully in Clause 8. Mr. Balfour therefore withdrew the original clause, and substituted one which is longer, more detailed, and incorporates part of Clause 8.

This is the original form of Clause 7:—

"7. All public elementary schools shall be managed in the case of schools provided by the local education authority by managers appointed by that authority under section fifteen of the Elementary Education Act, 1870, and in the case of schools not so provided, by the persons who are the managers for the purposes of the Elementary Education Acts, 1870 to 1900, and this Act."

This was the altered proposal:—

"7. (1) All public elementary schools provided by the local education authority shall, where the local education authority are the council of a county, have a body of managers consisting of a number of managers not exceeding four appointed by that council, together with a number not exceeding two appointed by the minor local authority.

"Where the local education authority are the council of a borough or urban district they *may if they think fit* appoint for any school provided by them such number of managers as they may determine.

"(2) All public elementary schools not provided by the local education authority shall, in place of the existing managers, have a body of managers consisting of a number of *foundation* managers not exceeding four appointed as provided by this Act, together with a number of managers not exceeding two appointed—

"(a) where the local education authority are the council of a county, one by that council and one by the minor local authority; and

"(b) where the local education authority are the council of a borough or urban district, both by that authority.

"(3) One of the managers appointed by the minor local authority, or the manager so appointed, as the case may be, shall be the parent of a child who is or has been during the last twelve months a scholar in the school.

"(4) The 'minor local authority' means the council of any borough or urban district, or the parish council, or (where there is no parish council) the parish meeting of any parish, which appears to the county council to be served by the school. Where the school appears to the county council to serve the area of more than one minor local authority, the county council shall make such provision as they think proper for joint appointment by the authorities concerned."

I have italicised some words in this second draft (which is really the third) because of alteration. As it stood, Clause 7 (1) insisted that "provided schools"—schools like Board schools, that is—should each be managed by a committee of managers appointed by the local education authority. That would have meant that a borough Education Committee could not "manage" all

the provided schools themselves, as a School Board does its Board schools now, but must delegate each to a coterie of nominated managers.

Mr. Gray, Dr. Macnamara, and Mr. Yoxall arose and smote this proposal; and Mr. Balfour withdrew it, replacing it by the words, "may if they think fit appoint for any school provided by them such number of managers as they may determine." This is a considerable change for the better, and it would not have been made but for the presence in Parliament of the Dauntless Three.

Another little change is the word "foundation" (italicised) for the word "trust." Connected with this is another notable piece of work which the Three succeeded in clenching. They obtained from Mr. Balfour the most absolute promise that if any item of substantial rent is charged for the use of the premises as a public elementary school, by the "foundation" managers, the school should cease to be an "aided" school and become a "provided" school—that is, a school absolutely and wholly managed in every respect by the local education authority. The effects of this guarantee will be far-reaching indeed.

An excellent piece of work to the credit of Dr. Macnamara and Mr. Gray, who, from opposite sides of the House of Commons, "backed" the Bill, was the carrying through of a little Bill extending by one year the power of a county or county borough council to authorise a School Board to carry on the Cockertonised higher grade and evening schools. By general consent, both in the House of Commons and the House of Lords, this Bill passed unopposed. The Act it amended lapsed on July 31st.

It will have been noted that in the new Clause 7, given above, reference is made to a method of appointing denominational managers. Mr. Balfour's proposals as to that are as follows:—

"After Clause 15, insert the following Clause:—

"(1) The trust managers of the school shall be managers appointed under the provisions of the trust deed of the school; but if it is shown to the satisfaction of the Board of Education that the provisions of the trust deed as to the appointment of managers are in any respect inconsistent with the provisions of this Act, or insufficient or inapplicable for the purpose, or that there is no such trust deed available, the Board of Education shall make an order under this section for the purpose of meeting the case.

"(2) Any such order may be made on the application of the existing managers of the school, made within a period of three months after the passing of this Act, and after that period on the application of the local education authority or any other person interested in the management of the school; and any such order where it modifies the trust deed shall have effect as part of the trust deed, and where there is no trust deed shall have effect as if it were contained in a trust deed.

"In making an order under this section with regard to any school, the Board of Education shall have regard to the principles on which the education given in the school has been conducted in the past.

"(3) Notwithstanding anything in any trust deed, the body of managers appointed under this Act for a public elementary school not provided by the local authority shall be the managers of that school both for the purposes of the Elementary Education Acts, 1870 to 1900, and this Act, and, so far as respects the management of the school as a public elementary school, for the purpose of the trust deed."

Perhaps the above proposals are unavoidably detailed and long, but they certainly afforded opportunity for endless "amendments," such as are being showered upon every detail in this Bill. Indeed, it was said by the Opposition members frequently that these proposals of method of appointing denominational managers aggravate their dislike to the appointment of denominational managers at all.

Moreover, in course of discussing the proportions of denominational and public-representative managers, hon. members took occasion to discourse at length upon the methods, prospective and in the new clause last quoted, by which the various managers were to be chosen, so that a vista of interminable length appeared before the eye, and nobody could say when Clause 7 would "manage" to get through.

Yet Mr. Balfour was bent on getting it through before Parliament adjourned for the recess, and it was becoming evident that this could not be done by the eve of the Coronation. The dreadful whisper went round that the House must sit on the Monday, Tuesday, and Wednesday following the Coronation, to finish this precious Clause 7. However, on the Wednesday previous to Coronation Day, pacific counsels prevailed, a truce was patched up, and the clause began to see hope of its end on Thursday.

Thursday came, and with it a manifest desire, on both sides of the House, to agree to postpone the discussion of machinery of electing or appointing managers, and to concentrate on the question of the proportions of the two kinds of managers. There was also an agreement that the clause should provide for the grouping of schools under the care of a body of managers more than six in number. This was provided for. And then the Attorney-General, for the Government, moved to omit all words in the clause, as I have printed it, after "appointed" in paragraph (2), and to insert the words, "also as provided by this Act." This was done, and shortly after midnight Clause 7, the perturbed and altered, went through the House of Commons.

So now till October the Education Bill goes to sleep. It will hardly be law before Christmas.

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BY MANY HANDS.

"Quot homines, tot sententiæ."

London's Professor of Education.

LONDON UNIVERSITY has acted wisely in coming to THE PRACTICAL TEACHER for its first Professor of Education. We refer to Mr. John Adams, M.A., B.Sc., Rector of the Free Church Training College, Glasgow, and writer of "Fagan, the Thief-Trainer," and other articles, in THE PRACTICAL TEACHER. It is with peculiar pleasure that we welcome the new professor south, for it

PROFESSOR JOHN ADAMS, M.A., B.SC.

was our privilege to congratulate him, in the pages of THE PRACTICAL TEACHER, upon his first flight southwards, from Aberdeen to Glasgow; and now that he has thrown in his lot altogether with the base Southron, we bid him welcome and God-speed from the bottom of our heart, for is he not a good man and true, and just the person that is wanted to give men and women a true conception of the dignity of the profession of teaching?

* * *

Not a Grace-of-God Teacher.

WE have a lively recollection of the lofty scorn the new professor, in his *Herbartian Psychology applied to Education*, poured out upon the superior person who says, with Doctor Johnson and the late Robert Lowe, that there is no science of education. We are assured that none of these grace-of-God teachers—as the professor, following Professor Laurie, delights to call these cocksure ignoramuses—will be turned out of London's new Training College for Teachers. Mindful of the fact that Professor Adams is himself a diligent student of the science of education, we confidently prophesy that he will endow his students with a double portion of his spirit, and send them forth to preach the gospel of teacher-training and child-study as necessary to the educational salvation of both the teacher and his pupil. Hence we welcome warmly the appointment of the Scotch schoolmaster to the honourable post of Professor of Education to the University of London. May the new professor live long and prosper mightily! Such is the wish, not only of ourselves, but also of practical teachers all the world over.

* * *

Stuffed Birds.

THE Nature Study Exhibition reminds us of an occasion on which the Board of Education allowed itself to be misled by faddists. It is a fact which we will not dispute that *sometimes* the desire to form and enlarge a natural history collection leads to the cruel slaughter of objects to fill the collection with. And the mischief does not end with the placing of the stuffed bird in the case; for after it is there, visitors may be seized with a desire to possess similar specimens, and thus other birds fall to the collector's gun. Where the collection is a public one, and available for the use of students, there is something to advance on the other side in favour of allowing such collections to be made. It was, however, very far-fetched to make this an excuse for the drastic rule which absolutely forbade the placing of stuffed animals in school museums. Surely, if a teacher's pet canary dies, there is no cruelty in having it stuffed and using it in the object-lesson, where the children will learn not only many interesting facts about bird-life, but also the duty of kindness to animals. We are glad to say that much more sensible views are now held, and we hope in the near future to give a short series of articles, showing our readers how they may prepare natural history objects for their own school museums.

* * *

The Late Mr. J. C. Horobin.

BY the death of Mr. J. C. Horobin, a familiar figure has been removed from the educational world, and from the arena of N.U.T. politics. His loss is keenly regretted by the very large circle of friends and co-workers who knew him so well, and especially by that long array of teachers who were trained under his care at the old Homerton College in East London, and during more recent years at the new Homerton, or, as it is now known, Cavendish College, Cambridge. A man of singular ability and untiring energy, Mr. Horobin got through an enormous amount of work during the life which has been cut short at forty-nine years of age. In the course of a professional career which commenced as a master in a small rural school, and closed as the head of a successful training college in a university town, his experiences have been exceptional and varied. Nor was his sphere of usefulness confined to the lecture-room. A busy

THE LATE J. C. HOROBIN, M.A.

writer on educational topics, much useful work has emanated from his pen. For many years an active member of the N.U.T. executive, he filled the offices of vice-chairman of the Education and Law Committees upon that body. His useful work in connection with the Cambridge Conference will be remembered by those who attended that function. He was for some time a

member of the London School Board, when he took a prominent part in the religious tests and corporal punishment questions which loomed so large in School Board politics in those days. He also identified himself with national politics, and at the last general election unsuccessfully contested Stowmarket in the Radical interest. While we lay our sprig of laurel upon the tomb of our departed comrade, our heart goes out in sympathy to the sorrowing widow and family who mourn a sad and untimely loss.

IT is not generally known that Dr. Leyds, of Transvaal fame, commenced life as an elementary schoolmaster. Yet such is the case. In the year 1880, like many more of us, he was engaged in the "noble work," though in his case it was in the primary schools of Amsterdam. In that memorable year Mr. Paul Kruger came to England upon his mission to the British Government. Subsequently visiting Amsterdam, he there came across the young schoolmaster Leyds, and at once recognised in him the very person that was necessary for his diplomacy. A characteristic story is told of the interview which resulted in the teacher renouncing his desk and turning diplomat.

Teacher-Diplomat.

As everybody knows, Kruger was, and is, a man of great religious pretensions. In the popular mind he is ever associated with his Bible as well as his pipe. But Leyds the schoolmaster was an atheist.

In the course of Oom Paul's proposals, which embraced both politics and psalms, Leyds bluntly but honestly informed the President that he was an unbeliever. "I don't believe the Bible," said he.

It came as a shock, doubtless, and Mr. Kruger pondered long and seriously ere he replied. But the wily old man could swallow much. His ultimate reply was, "It matters not. I will forego. You must come."

So the schoolmaster became a diplomat. He entered upon a new life that brought him much renown, but very little honour. When one thinks of the events of the last decade, and the part that Dr. Leyds has played in the great drama, one realises that if he had resisted the advances of Mr. Kruger, and stuck to his school, he would perhaps have contributed more to the happiness of the world.

PROFESSOR LLOYD MORGAN, in his address at the Nature Study Exhibition, told a good story of the very practical parent who brought his son to Sir Andrew Ramsay for the study of geology at the School of Mines. "Mind you, professor," said he, "I don't want my boy to learn about stratified deposits or fossils, about upheaval and denudation, limestones, crystals, or minerals, or any such useless stuff. I want him just to be taught how to find gold, and silver, and copper, and other precious metals and gems, *in paying quantities, sir, in paying quantities.*" The story raised a laugh, and the speaker went on to explain that the object of introducing "nature study" into the rural schools was that the children who lived in the country should, when they left school, find themselves in sympathy with their surroundings, and be capable of taking an intelligent interest in the pursuits and occupations which were open to those who lived in the country. "Nature study," under the conditions of the village primary school, must be regarded as a practical preparation—but only a preparation—for the generalisation of science, which the youthful mind could not as yet grasp. There is much truth in the professor's words; but it is doubtful whether the agriculturists, who are looking with so much favour upon this "nature study" project, regard the matter in the same way.

Nature Study.

THE teacher rightly regards "nature study," prosecuted under suitable conditions, as a healthy intellectual exercise, intended to encourage the habit of observation among the children, and to awaken the spirit of inquiry. The practical agriculturist—like Professor Ramsay's visitor—looks at the matter from the "paying quantity" point of view. We had the pleasure of discussing the question with an enlightened agriculturist, who was particularly enthusiastic over the "nature study" enterprise. "It is an excellent idea," he said. "If the country children can be got to take a lively interest in the objects of nature that surround them, they will be less disposed to quit the villages for the towns. Anything that will tend to arrest this migration will help to make farming pay, and, of course, that is what we want." This hits off the situation. No one will quarrel with the farming community for adopting any sensible expedient that will revive an industry that is almost bankrupt. We are all anxious to see farming made to pay. It is, however, our duty to see that "nature study" does not degenerate into a fad, and that it does not militate against that general education of little John Hodge, which is as much his heritage as a citizen of the empire as it is the heritage of the city-born child.

What the Agriculturist thinks.

IT is to be feared that those who look upon "nature study" as an effective antidote to the exodus "fever" will be greatly disappointed. Country children are not nearly such dunces in this matter as they are often made out to be. Any seven-year-old villager will give points to that M.P. who once described a mangel-wurzel as a kind of turnip. Nevertheless, it is well to give them the principles of nature science rightly. Let us help them to probe the mysteries of plant life, to discriminate, to know and admire the flowers, the insects, and the many varieties of animal life. It will do them good. It will refine their tastes and their sympathies. It will help to make them better men and women. But, dear British farmer, and my dear Mr. "Nature Study" Enthusiast, pray do not imagine that this alone will make them "stick to the land" and avoid the towns. You may educate your little peasant in "nature study" till he sees with the eye of a poet; you may develop his sympathies till he can recognise the "music of the spheres," till he can discover the jewel in the head of a toad, or till his "heart leaps up when he beholds a rainbow in the sky"—but this is not enough of itself to keep him on the land.

The Rural Exodus.

IT is all a question of "bread and cheese." Shakespeare came to London because it paid him to do so. So has many another dear lover of nature. What prospect has an intelligent labourer in the country? It is the prospect of a life of monotonous toil. Provision for old age is almost out of the question. It is useless to talk about thrift to a man who tries to rear a family on twelve shillings a week. Is it surprising that the sprightly village boys turn their attention to the army, navy, police, the railway, the factory, and even the mines, in

A Question of Subsistence.

preference to the lifelong, hopeless drudgery to which their fathers are condemned. Twelve shillings a week, even when supplemented by the song of the nightingale and all the glories of nature, are not an adequate "retaining fee" to induce them to stay on the farm. There are many reforms to be effected before the exodus will be arrested. By all means prosecute the "nature studies;" make your village schools as efficient as possible, that they may give the instruction effectively; but you are living in a fool's paradise if you imagine that this will keep the boys in the village, unless a better life's prospect can be held out to them.

"OH, yesh," said our young Dutch friend—a teacher from Amsterdam—"we lof Eenglish books ver' much in Holland. Ze Dutch teachers are great readers, ver' great readers. Most of them can read books in Eenglish, in German, and in French, as well as in Dutch. Yesh, Shakespeare and Milton, and all ze best books, are translated into Dutch. But the best belof'ed is Deekens—Charles Deekens, who wrote *Oliver Tweest*. Oh! we laugh much at 'Peekveek,' and 'Mr. Veller,' and 'Vinkle.' Ver' much. Oh! Deekens is much belof'ed by the vorking people in Holland. They all read his books in Dutch, and most of them think that Deekens is a Dutchman."

Dickens—a Dutchman.

We were surprised at the extensive knowledge of English literature possessed by our colleague from over the sea, a knowledge that should make some of us "native born" blush; but it was more than surprising to find that Dickens is proudly claimed by the working men of Holland as a Dutchman. "One touch of nature makes the whole world kin." Surely the prospect is hopeful. The hatred that is supposed to exist between the two peoples cannot be very deep when their literary sympathies are so much alike.

THE recent correspondence in *The Spectator* anent the redoubtable Dr. Keate of Eton, who on a certain Saturday afternoon flogged a batch of eighty youths for neglecting to attend a roll call, reminds us of the important part which the birch played in public school education. Boswell tells us that when Doctor Johnson was once complimented by a friend upon his great knowledge of Latin, the old lexicographer replied, "My master whipt me well; without that I should have learned nothing." Away back in mediæval and even ancient times the schoolmaster was always associated with the rod. And some of those old fellows were veritable Spartans. Dr. Busby of Westminster was so terrible that he was known as "awful Busby." When the old "birchroom" of the school was removed, a very smart poem was recited at a dinner of "Old Westminsters," of which the following are two verses:—

Knights of the Rod.

"From time to time his watchful ear
Caught the well-known notes of fear
From hapless victims forced.
'Fetch me that rod!'—This soothed his soul,
Recalling all his ancient roll,
And maxims stern endorsed.

"But now the garish light of day
Let in scares spirits all away;
Hard, Busby, is thy lot!
For how, great doctor, canst thou find
Ease and contentment to thy mind,
Where birchen rods are not?"

DR. WOOLL of Rugby won much renown in this department of educational work. Like Keate of Eton, he was small but vigorous, and a terror to wrongdoers. One day he was showing Lord Lyttleton round the school. They came to the "flogging room." The doctor was in a merry mood, and pleasantly asked his distinguished visitor what he thought would be a good motto for that particular chamber. Glancing at the diminutive figure of the headmaster, and knowing well Dr. Wooll's disposition to the use of the rod, Lord Lyttleton suggested, "Great cry; little Wooll," as a suitable motto.

"Great Cry; little Wooll."

We are told that when Dr. Hornby was appointed headmaster of Eton, he was presented by the "captain" of the school, on behalf of his fellows, with an elegant birch rod tied with blue ribbons. The usual rod at Eton consisted of three long birchen twigs bound with string about a quarter of its length. We are further informed that in the olden days a charge of half a guinea for birch was made on every boy's bill, whether he was flogged or not!

IT must not be thought that the birch was an unpopular institution among the boys in those old days. It was often considered a reproach not to have been birched. The following schoolboy effusion shows how it was appreciated:—

The "Rod" inspires the Poet.

"The muses declare, after diligent search,
No tree can be found to compare with the birch;
The birch, they affirm, is the true tree of knowledge,
Revered at each school, and remembered at college.
Though Virgil's famed tree might produce as its fruit
A crop of vain dreams, and strange whims at each shoot,
Yet the birch, on each bough, on the top of each switch,
Bears the essence of grammar and eight parts of speech.
'Mongst the leaves are concealed, more than memory can mention,
All cases, all genders, all forms of declension."

Among the curiosities of literature is an effusion entitled the *Rodiad*, which was written by the younger Coleman; and it is a matter of history that the poet Southey had to leave Westminster School because he caricatured the headmaster, Dr. Vincent, in a contribution which appeared in a journal run by the boys themselves, and called *The Flagellant*.

TEACHERS who may be thinking of taking up their abode in South Africa would do well to consider how far the salaries offered there are capable of meeting the needs of the situation. In a recent issue of *The Times* there appeared a letter which set forth with painful clearness the expensiveness of living in the new colony. Says the writer:—"House rent, even in cases where the premises occupied are of the humblest description, is exorbitant, seldom falling below £300 a year. A cook's wages are from £7 to £10 monthly, a Kaffir house-boy's from £4 to £6. The minimum cost of feeding a horse is £60 a year. Meat from cold storage depôts costs from 1s. to 1s. 2d. per lb.; fresh killed meat is unprocurable. Railway travelling, first class, costs 3d. per mile. Even newspapers cost 3d. From the above figures, it will be possible to form an idea of the difficulty the married civil servant, drawing a salary of from £500 to £700 yearly, has in making ends to meet." These conditions speak for themselves, and intending emigrants from the ranks of teachers would be wise to consider them before taking the final step.

A Word of Warning.

WITH OUR CHILDREN.

AMONG the many events arranged in connection with the Coronation, only one need be mentioned here—the Conference on Child Study at Normansfield, Hampton Wick, on the 24th of June. The great Institution there, presided over by Dr. Langdon Down, formed an appropriate and convenient locality for such a meeting, and the popularity of the event is attested by the fact that over seven hundred guests were received by Dr. and Mrs. Langdon Down at the garden party which followed the conference. The B.C.S.A. are once more deeply indebted to the host and hostess of the day; such a gathering is of immense value socially to the London Branch in their propaganda, apart altogether from the brief but weighty and well-judged speeches which were delivered at the conference.

A Coronation Function.

THE conference was fortunate in its president, Sir James Crichton-Browne, whose address, in justifying the aims of the B.C.S.A., rose to a high level of eloquence. "I think," he said, in one memorable passage, regarding the evils of harsh methods—"I think our parents and guardians and teachers would all be more gentle in their manipulations of the brain, if they could realize that it is of the consistency of firm jelly, that it is like a sponge full to the dripping point of blood, that it is made up of a starry firmament of cells arranged in millions of constellations, and of a silvery filigree of fibres beside which the threads of the gossamer are coarse and clumsy cables,—I think that parents and guardians and teachers would sometimes be less exacting than they are in their demands on the brain, less intolerant of its failures, if they could picture to themselves its functional activity, now shimmering over its surface from point to point like the aurora in the northern sky, now almost vanishing in intervals of slumberous ease, now flashing forth in moments of passionate emotion, now glowing with a steady light as in tranquil thought, now gathered into a spark of dazzling brightness as in moments of concentrated attention."

The Brain.

REFERRING to the anthropological importance of child study, the president pointed out the value of the observations which may be made by observers who are in contact with the children of inferior races, as many teachers are in our own colonies. Incidentally he spoke words of comfort to the parents of children who are *not* prodigies—a quantity which is not negligible—when he remarked that the children of inferior races are usually precocious as compared with those of higher races, and that "in all human—I might say in all animal—life high evolution is late evolution." And yet we are often invited to wonder at the dull school record of this and that distinguished man! Let us respect mediocrity in childhood; therein may lie the safety of the race.

Regarding Precocity.

MISS Louch, one of the founders of the B.C.S.A., had the place of honour in the conference with an admirable little contribution on "Objections to Child Study." In dealing with the charge of want of reverence for childhood which is sometimes made against students of children, she turned the tables very neatly on those who quote the proverb about the rushing in of "fools" as contrasted with "angels:" she made the point that those who really "rush in" are the teachers or parents who control and direct the life of the child without devoting study to the nature and laws of the child. In making that nature and those laws the guiding principles of their work, child students are clearly on the side of the "angels." This is a point which we should like to emphasise here; it seems clear enough without elaboration.

"Angels" and the Others.

DR. C. W. KIMMINS spoke strongly on the need for child study in the home, especially, perhaps, having in mind those homes where the parents hold themselves as excused from their duties when they have secured a nursemaid as deputy at a salary lower than that of a competent cook. The ghastly and criminal neglect of young children which this system of devolution evinces will not be easily eradicated, but we hail the efforts of medical men in this direction as likely to do more than those of any other class. It is they alone who may be expected to prevail in securing for the children of the middle and upper classes a more rational treatment during their tenderest and most impressible years of life. What is needed is first to inform the mind and then to awaken the conscience of the mother, and in both we think the physician is the most hopeful missionary.

The Question of Nursemaids.

MR. HOLMAN, H.M.I., naturally found his subject in school life. The point in his address which seems most to the purpose at present is this—that child study requires no special exercises to be done in school; the ordinary school work is not only enough, but is the best kind of material for revealing the child. What is essential is the point of view. All ordinary work, as well as special work, gives a revelation of the worker to one who can interpret it aright. Mr. Holman is strong upon the high mental equipment required for the adequate study of children, but few will quarrel with his position. He speaks as an expert, and he has seen the results of all kinds of work in this line. An inspector who is also an educationist may be a somewhat rare phenomenon, but all the more on that account do his views deserve very careful consideration from educationists of all grades.

School Work and Child Study.

FROM the full and able paper of Dr. G. E. Shuttleworth on "Child Study in Relation to Defective Children," we shall cull only one sentence: "The study of the abnormal child may throw light upon the normal functions of the mind; and I think I may almost say conversely, that for those who have to study the abnormal child, it is most important that they should know how to study the normal." When one considers that there is no fixed line between normal and abnormal, and that there are infinite gradations under either heading, the principle seems almost a truism. And yet, like so many self-evident truths, it is a truth that will need some repetition before it comes to be acted upon. We have said before in these columns that in schools for defective children alone, perhaps, do we find education really based on a study of the child.

Normal and Abnormal.

REGARDING the remainder of the discussion, in which Mr. Buckmaster, J.P., took part, space

forbids comment. Such a gathering of experts is a notable fact in the history of the B.C.S.A., and we may confidently express the hope that the London branch and the Association as a whole will gain from it a new store of ideas and of energy for its future work. J. G.

Afterwards.

N.U.T. NOTES.

TEACHERS are peculiarly prone to utilise, and create when necessary, abbreviations; and nowhere is this more noticeable than in the popular names of the most influential professional organisations. Every one knows, of course, the N.U.T. and M.B.T.A.; and it is fast becoming generally understood that the N.F.A.T. is the National Federation of Assistant Teachers, the formation of which was, ten years ago, opposed strenuously and most vigorously by the officials and executive of the N.U.T. At that time there was a fear—altogether groundless, in my own opinion—that the assistant teachers were likely to break away from the mother Union, and establish an entirely independent organisation which should provide, in Mr. Peaker's historic phrase, "a box hat and office" for some ambitious individual. So far from anything in the nature of a secession, the eighty or ninety branches of the N.F.A.T. have proved the most valuable recruiting agencies the N.U.T. has possessed. They have, in addition, been admirable training grounds in public affairs and business experience for the class teachers throughout the country. The harvest may be annually evidenced at the peripatetic Assistants' Conferences, which compare not at all unfavourably with the grand demonstrations of the older Union. It may not be generally known that the association inviting Conference acts as host, in the fullest sense of the word, to the couple of hundred representatives in attendance. The expenses of a conversazione, midday refreshments, and public dinner are all borne by the locality, whilst from Friday to Sunday (or Monday) entertainment and hospitality are forthcoming under the roofs of the local teachers for all who desire such. The Federation is ably officered and admirably manned, and the membership for the current year is a "record" one of well over 8,000. Four members of the Federal Committee have seats at Russell Square; and it is hoped, with some amount of confidence, that after Easter next, Messrs. Goldstone, Ruse, and Williams will be added to the "concentrated wisdom of the Union."

The "N.F.A.T."

NOWADAYS, not only has every profession, trade, and occupation its particular "organ" in the press, but, so far as we teachers are concerned, there are quite as many media of communication as there are sections, and even sub-sections, of pedagogues. The latest comer is *The Class Teacher* (the official journal of the N.F.A.T.), which has recently made its *début*. The editorial pen is wielded, in most able fashion, by Mr. Frank Goldstone of Sheffield, through whose zealous advocacy the project of publication was assented to, nine months ago. The editor frankly disdains all intention of specialising "in grievances." He writes: "Our outlook will be that of *the teacher*, and hence the general question of education will absorb much of our attention. We hold strongly that it is the paramount duty of every member of the N.U.T. to be a teacher first and foremost, and then differentiation is no loss, but a gain." Special articles on the Education Bill are contributed by the president of the N.U.T., and Mr. W. Sinclair—a gentleman who retired from the executive eight or nine years ago, to the great regret of those who were privileged to be his colleagues. Mr. A. E. Cook, vice-president of the M.B.T.A. (than whom there is no better authority) writes lucidly on "The Present Position of Evening Continuation Schools;" whilst the question of "Inspection *v.* Examination," revived largely through the agency of Mr. Ricks, is dealt with in masterly style by Mr. A. W. Dakers, B.A. Naturally, the doings at Bristol loom somewhat largely in this first issue, and there are plenty of "Notes and Comments" of special interest to class teachers. Almost hidden away in a corner is what is termed an "Index Expurgatorius"—a short list of School Boards paying "a very inadequate scale of salaries." If the publication of such a list be thought advisable, it should certainly have a more prominent position assigned than at present. I understand that the intention of the Federal Committee is to issue the *brochure* free to every member of the Federation. The "latest arrival" has been greeted with much cordiality in every quarter, and its advent should undoubtedly do something to quicken the interest of the *laissez-faire* class teacher in both educational and professional affairs.

"The Class Teacher."

PROBABLY every one is aware that this year a big attempt is being made to raise the membership of the N.U.T. to, at least, 50,000. Local secretaries and officials are straining every nerve to make the non-Unionist as extinct as the dodo in their particular districts; and if they do not achieve they certainly deserve success. For many years past the Organisation Committee of the executive has endeavoured to secure permission from the training college authorities for a representative to attend and deliver a brief address to the outgoing students on the aims and objects of the Union. At the outset, the privilege was accorded in but a few instances. Happily, however, as with the flux of time the aspirations and intentions of the Union are more completely understood, the number of colleges willing to receive a deputation becomes steadily larger. Some day, perhaps, we shall have no refusals at all; but the day is not yet. Since 1895, I have visited many colleges, as a kind of Union missionary, and have been invariably touched by the keen and sympathetic interest evinced by the students. Possibly the most enthusiastic audience I ever addressed was one at Owen's College, Manchester, three or four years ago. (I forbear to relate my one depressing experience, for obvious reasons.) This summer it has been my good fortune to make the acquaintance of the students and staffs at Ripon, and the new Homerton College, Cambridge. I was charmed with all I saw at Ripon, and Principal Garrod is deservedly proud of the wonderful success of the institution which he so ably directs. The new Homerton College must be *facile princeps* so far as edifice and equipment are concerned, and the contrast between its delightful surroundings and those (say) of some of our metropolitan colleges is sufficiently striking. To my intense sorrow, I found Principal Horobin—an old and esteemed colleague on the executive—stretched on a bed of sickness. He has since succumbed to a fatal and insidious disease, to the great grief, not only of his widow and children, but of the members of the N.U.T., whom he served long and well.

Visiting the Colleges.

THE meetings of the executive are naturally "closed" to the outsider, but occasionally distinguished visitors from other lands are accorded the *entrée* to the Bolton House board-room when the executive is in session. On the eve of the recess, Mr. W. J. Bevington, a member of the executive of the Queensland Teachers' Union, and a former president of the organisation, was cordially welcomed, and sat at the *table d'honneur* for some three hours, apparently keenly interested in all that transpired. Under the pleasant ciceroneship of Mr. C. W. Hole, he visited the magnificent Boys' Home at Sydenham when the "old boys'" reunion was going on, and thus saw perhaps the noblest side of the Union's work. Last year we had a visit from Mr. Hughes, the treasurer of the New Zealand Teachers' Association. Possibly a future generation may see the formation of an Imperial Teachers' Federation, which even now has been talked about in certain influential quarters.

"Hands Across the Sea."

NOTHING strikes the visitors to Page Hall and Sydenham quite so much as the bright and happy faces of the fatherless boys and girls, whose welfare, both mental and bodily, is watched and guarded with loving care. The Central Council of the B. and O. Funds and the House Committees of both Boys' and Girls' Orphanages have, for some time, had under consideration how best to keep in touch with the children passing through the Homes. Many suggestions of a practical nature—eminently creditable to the hearts and heads of the makers—are forthcoming. Space is too limited to allow of their incorporation in these "Notes." I may state generally, however, that the intention is to secure the special oversight of particular boys and girls by members of the House Committees, who shall report annually to the central body. Efforts are also to be made to institute an "Orphanage Correspondence Day," on which all old boys or girls will be expected to write to the Homes (either to the Committee, the Matron, or the children in residence). It is hoped that this correspondence will keep the Committees in touch with the old boys and girls in a friendly and informal manner.

"Our Boys and Girls."

THE traditions of the primary schools die hard. One sacred legacy is what I venture to describe as the old "poker-back" method of discipline. The teacher was a veritable martinet, and his object was only achieved when he "could hear a pin drop" in the school, and when no child gazed off his book, even when "the discipline tester," in the shape of H.M.I.'s dog, was sent yelping or barking into a classroom. Although I cannot yet write *tempora mutantur*, still the times are undoubtedly changing, and it is not particularly surprising that (in this, as in every similar case,) the pioneers of reform are misunderstood, and probably suffer. Mr. T. P. Sykes, one of the best known and most highly respected members of the executive, is the master of Great Horton Board School, Bradford. This school has an average attendance of about 700 boys and girls in the mixed department, and its staff consists of eleven certificated assistants, three ex-pupil-teachers, and four juniors. "Some two and a half years ago a meeting of the staff was held, and it was decided, as an experiment in discipline, to allow boys and girls to walk in and out of school under the teacher's supervision, but without any set order. Strict control by the teacher of each class was only to begin when the children reached their seats in their respective classrooms. The idea was to put the behaviour of the children a little more into their own hands, and to encourage the exercise of self-control." The result of the experiment was the inclusion in the report of the school of this sentence, "*The discipline of the boys is somewhat loose.*" The writer should have been *arbiter elegantiarum* instead of H.M.I. As the result of vigorous action by Mr. Sykes, the Bradford School Board, and the N.U.T. Executive, the sentence above quoted is now followed by, "This relaxation of discipline is not, I believe, the result of any carelessness or incompetence on the part of the teachers, but of an experiment which is being purposely tried in order to test the effect of a somewhat looser and less rigid order than has hitherto been aimed at. Whether such an experiment will be a success remains to be seen." The *teachers* are thoroughly satisfied with the results of the experiment, and I congratulate Mr. Sykes and his colleagues on their efforts to secure that their precious charges shall be natural, and not either marionettes or little prigs.

A. C.

An Experiment in Discipline.

NOTES FROM THE NORTH.

FROM present indications there is not likely to be any event of outstanding importance in connection with the September meeting. The year, in many respects, has been most uneventful; educational affairs have simply kept the even tenor of their way, largely owing to the introduction of the English Education Bill. Scotland will require to wait for secondary education legislation until the Education Bill has been disposed of; so that the retiring president, Mr. George Rae, Wamphray, will not be able to deal with any particular point of educational politics connected with the present year. Whether, therefore, he will deal with the future or the past remains for the meeting-day to disclose. Mr. A. Watson, his successor, will have a very interesting meeting to preside over, particularly with regard to the domestic policy of the Institute. The new rules for the election of the general committee may cause a breeze, as I hear they are not giving entire satisfaction, especially to the smaller and country branches. The question of a teachers' member of Parliament may evoke some discussion; but I rather fear that the Institute is not ripe for the settlement of this question, so that the matter may be postponed for an indefinite time. The minutes of the General Committee, as usual, will most likely occupy the greater part of the afternoon sederunt, but it is to be hoped that the meeting will not become quite so lively as that of last year. The branches have effectively dealt with the report brought forward last September by Mr. Duthie, Aberdeen, *re* the officials' duties and salaries. There was some sympathy for the proposal last September, but there seems to have been none at the meetings of the various branches.

The September Meeting of E.I.S.

BOTH the General and Special Committees of the Institute have had under consideration the question of alleged undue pressure in connection with teachers' classes for drawing, etc., and the matter has now been sent down to the local associations for information. Very conflicting opinions with regard to the pressure were given in both committees, and while it is well to forestall any such tendencies on the part of school managers,

Pressure on Teachers to attend Classes.

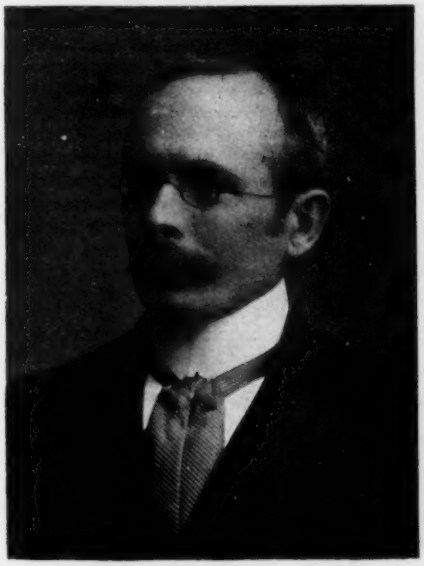
yet I question if the local associations will be able to contribute any material information on the subject. There can be little doubt that in some districts teachers are finding that it is in their own interests to qualify themselves in the new departments of scholastic work, but their attendance is voluntary. Much of the pressure is due to the Department's methods of dealing with the qualifications of teachers in drawing. In many schools word has been received from the Department that "the qualifications are satisfactory *for the present*." It is this last phrase that is causing the trouble. I venture to think, however, that the Department does not propose to make the qualifications more rigid; in fact, there are indications in some quarters that the Department has perhaps gone too far in its drawing schemes by cutting out of the curriculum some subjects which formerly found a place. But no doubt something will be heard soon about the matter.

THE discussion of the Scottish estimates served to show pretty conclusively that the Treasury are not likely to be too generous in granting money to Scotland, even as an equivalent to that already conceded to England. There seems to be a feeling that Scotland had better wait until the new Education Bill is forthcoming, before anything should be done with this ear-marked money. I express doubtless the desire of all educationists in Scotland, when I say that I hope there is no truth in the rumour that the Scotch Education Department are likely to lose the services of Lord Balfour of Burleigh. Rumour has a bad name, and we trust that in the present instance she does not belie her reputation. His transference would be a serious loss to Scotch education, for Lord Balfour of Burleigh, by his sagacious policy and clear-headed statesmanship, has done much during recent years to advance education. In him education has a good friend and a tried counsellor.

Education in Parliament.

THE vacancy in the Professorship of Education at St. Andrews has been filled up by the appointment of Mr. John Edgar, M.A., F.S.A. (Scot.), classical master, Royal High School, Edinburgh. Mr. Edgar received his school education at Dumfries Academy, where he was dux in both classics and mathematics. At the University of Glasgow he gained an open scholarship, a bursary, and high prizes in Latin, Greek, logic, and natural philosophy. At the close of his curriculum there he graduated with first-class honours in classics, and was awarded the Snell Exhibition. After studying for four years at Balliol College, Oxford, he graduated with honours in classical moderations, and in the Final School of Literæ Humaniores (1882). At Oxford Mr. Edgar spent much time on the study of modern languages, and the theory of education. As a practical teacher Mr. Edgar has had long experience. For a short time he taught English and classics in Dumfries Academy, but the chief part of his professional experience has been obtained in the Royal High School of Edinburgh. For a time Mr. Edgar acted as secretary of the Secondary Schoolmasters' Association in Scotland. He attended the class of education in the University of Edinburgh, and holds the Higher School Diploma in Education of that university. He has had a wide experience as an examiner, and for a period of four years (1897-1901) he held the office of Examiner in Classics in the University of Glasgow. Mr. Edgar has written and published *A History of Early Scottish Education* (1893); translations of the *Homeric Hymns*, and of *Æschines in Ctesiphontem*, with introductory essays; a book on *Latin Unseens*, with essay on Method in Translation;

Professorship at St. Andrews.



PROFESSOR EDGAR.

and various articles and reviews on educational subjects. He has made considerable progress with a new book on the Philosophy of Education. Mr. Edgar takes up his duties at St. Andrews on the opening of the winter session in October.

AT the dinner of the Edinburgh Merchant Company Lord Elgin referred to a conversation he had had with the Secretary for Scotland on the subject of future reforms in secondary and technical education. Lord Balfour, it appeared, was not unwilling to introduce certain reforms; but it was not in his power—it lay with the House of Commons. Lord Balfour said that what would be absolutely necessary was an extension of area. It is a hundred pities that the officer in charge of the administration is hampered by the legislative machine, which moves so rustily. Once the English Education fight is over, surely an opportunity for this much-needed reform will be found. One other matter involved in the extension of area, Lord Elgin remarked, was that it must include every one within the area, and that there must be some co-ordination or co-operation between rating and endowed authorities. If rates were to be levied compulsorily on all the inhabitants, these must be under the control of, and be expended by, a representative body. He trusted, as we all do, that Lord Balfour would soon be in a position to carry these out.

Lord Elgin on Educational Reform.

THE Carnegie Trust, of which Lord Elgin is chairman, have issued a letter to the secretaries of the four Scottish universities, showing the scheme of distribution for the next five years. Glasgow University is to get £11,000 for five years, making a total grant of £55,000. Of this,

The Carnegie Trust.

£40,000 is to be expended in buildings and permanent equipment, whilst £10,000 is to be devoted to teaching—the endowment of a chair of geology being the most important—and £5,000 towards the expenses of the library. To Aberdeen University has been granted £9,000 for five years, a total of £45,000, of which £5,000 is to be devoted to buildings and permanent equipment; and to teaching—endowment of a chair of history specially—£35,000; and library, £5,000. To St. Andrews, £8,500 for five years, a total of £42,500: in buildings and permanent equipment, £15,000; and in teaching, £22,500; and the library, £5,000. Edinburgh University is to get £11,500 for five years, a total of £57,500, of which buildings and permanent equipment obtain £40,000; and teaching—the endowment of modern languages particularly—£12,500; and the library, £5,000. These grants take cognisance of the pressing needs of the day, inasmuch as they are entirely devoted to modern requirements. They realise the value of the highest education in maintaining the race in the forefront of the struggle for existence, and in the great competition for industrial and commercial supremacy. R. G.

MODERN EDUCATIONAL REFORMERS.

LORD AVEBURY.

A Popular Exponent of an Unpopular Subject.—Amid all the disagreement that prevails amongst the thinking portion of English people, with respect to the complex problem of popular education, there is at least one tenet held by all who have any acquaintance with the subject, and that is a conviction of the universal prevalence of apathy in this country, not only as to the solution, but also as to the consideration, of this most vital of all problems. English people do not believe in education—that is the long and the short of it. It is therefore just as pleasant as it is surprising to find a busy man of affairs so convinced of the importance of this neglected question as to devote himself to it enthusiastically and tenaciously, the press of business and the calls of other pursuits of leisure, notwithstanding. Yet not only true is this of Sir John Lubbock (now Lord Avebury), but it is also only a small portion of the truth concerning his endeavours and achievements in the cause of educational reform and perfection. And a study of the life of the banker-reformer only increases our surprise, and, let us add, admiration, that Lord Avebury should put professionals to the blush in his efforts to popularise and rationalise the education of the people of England; for, as the new volume of the *Encyclopædia Britannica* says, "As a thoughtful populariser of natural history and philosophy, he has had few rivals in his day."

His Life.—And now let us see what there was in the nature and nurture of this son of London that should impel him to go out into the highways and byways crying, "Educate! educate! Educate yourselves, and, above all, educate the people!" He was the son of the distinguished mathematician and philosopher, Sir John William Lubbock, who died in 1865, and who was in his time treasurer and gold medallist of the Royal Society. Born in London on April 30, 1834, the son was educated privately and at Eton; but was taken from school into his father's banking-house at the age of fourteen! He thus enjoyed a school-life shorter in years than that of many a peasant's son. That he had both the grip and the grit needed for the making of a business man is shown by the fact that he was made a partner at the age of twenty-two years, when one would have expected to find him amongst those whom Kipling has irreverently dubbed the "flannelled fools and the mudded oafs" at Oxford or Cambridge. But, like so many more eminent men, the university knew him not. Where then did his zeal for education come from? That is the mystery. That he had such zeal even at this period of his life is proved by the fact that he was chosen to serve on the Education Commission. In 1870 he became Member of Parliament for Maidstone, in the Liberal interest; and when, in 1880, he was the rejected of Maidstone, he was promptly chosen to represent London University at St. Stephen's. Nor had he ever to seek another constituency, for he represented the university until, in 1890, he was raised to the peerage as Lord Avebury.

Saint Lubbock.—Everybody knows that Lord Avebury has been informally canonised, and that he is the beneficent Saint Lubbock at whose shrine we all worship on the six bank holidays which he was instrumental in placing upon the statute book of the country. It was in 1871 that he achieved this feat, which shows how deeply interested he was then, as now, in the weal of the common people, who cannot be educated if they have no leisure. Another legislative accomplishment of like nature was completed in 1889, when the "Shop Hours Bill" became law; and various other acts relating to the currency bear witness to the fact that the member for London University was not of the ornamental variety only.

His Books.—The books written by Sir Lubbock, as the French call him, are notable contributions to the study of natural history and archæology, which subjects the boy who left school at fourteen has made peculiarly his own. We have all heard the story of the seaside visitor who asked the local librarian for Ouida's *Moths*, and was told that the book was not in the list, but he had Lubbock's *Ants*, which would perhaps do as well! This only adds point to what is rapidly becoming an actual fact—namely, that the ants of the popular scientist will be known and respected long after the "moths" of the popular novelist have sunk into oblivion. In order of appearance the books are as follows:—*Prehistoric Times* (1865), *The Origin of Civilisation* (1870), *The Origin and Metamorphoses of Insects* (1874), *British Wild Flowers in Relation to Insects* (1875), *Ants, Bees, and Wasps* (1882), *The Senses and Instincts of Animals* (1888), *The Pleasures of Life* (1889), *The Beauties of Nature* (1892), *The Use of Life* (1894), *The Scenery of Switzerland* (1896), *The Scenery of England, and the Causes to which it is Due* (1901).

These books must be well remembered when tracing the career of Lord Avebury as an educational reformer, for the reform that he championed so long and so persistently, as we shall see later, was that so aptly expressed by Wordsworth in *The Tables Turned*:—

> "Up! up! my friend, and quit your books,
> Or surely you'll grow double;
> Up! up! my friend, and clear your looks,
> Why all this toil and trouble?
> Come forth into the light of things,
> Let Nature be your teacher."

Academic Distinctions.—We have said that Lord Avebury had no university career. It does not follow that he has no university distinctions. Quite the contrary is the case. Oxford, Cambridge, Edinburgh, Dublin, and Würzburg have honoured themselves by honouring him in the bestowal of their degrees upon him; moreover, he was in 1886 chosen as Rede Lecturer to the University of Cambridge. He was made Vice-Chancellor of London University in 1872, a position that he retained until he became member for the university in 1880. He was President of the British Association for the Advancement of Science in 1881, and he has been President of the London Chamber of Commerce and of the London County Council. In 1890 he became a Privy Councillor, and surely no Englishman of to-day is better able to give good counsel; and in 1891 he was made Chairman of the Committee on the Design for the New Coinage. In January 1900, as already intimated, he was raised to the Peerage as Lord Avebury.

The Apostle of Nature Study.—Whilst visiting the Nature Study Exhibition, recently held at the gardens of the Botanic Society, Regent's Park, we met slim, alert Dr. Gladstone on one day, and the day before we had listened to the eloquent address of Lord Avebury, the climax of which was couched in the following words:—"I submit that sane study of nature is an essential part of a complete education." That is just our reformer's

position, and later on in his address he showed why. "I often grieved," he said, "to think how much happiness our fellow-countrymen lost from their ignorance of science. No one would sit and drink in a public-house, if he knew how delightful it was to sit and think in a field; no one would seek excitement in gambling and betting, if he knew how much more interesting science was." Here we see, writ large, the desire for the salvation of the people, and also the conviction that this can only be effectually won by teaching and training them to take an intelligent interest in the world around them, to the intent that they may look from nature to nature's God.

Si monumentum requiris, circumspice.—The Nature Study Exhibition is indeed a monument to the efforts made by Lord Avebury, Dr. Gladstone, and a few other kindred spirits. Another sign of the success of the work of these pioneers is the institution of an education section to the programme of the British Association of Science—an innovation initiated at the Glasgow meeting of last year, and which cannot but bring forth fruit abundantly in the fullness of time. A further change, due also to the change in public opinion, is the enaction of a modicum of science as a necessary part of the curriculum of every school as a condition of receiving a Government grant. We rejoice that this instalment of reform, imperfect though it be, has been realised in the day of Lord Avebury. At any rate, we are a step removed from that view of nature which Lord Avebury describes as follows:—"Too many, however, still feel only in nature that which we share 'with the weed and the worm:' they love birds as boys do—that is, they love throwing stones at them; or wonder if they are good to eat, as the Eskimos asked about the watch; or treat them as certain devout Afreedee villagers are said to have treated a descendant of the Prophet—killed him in order to worship at his tomb;" and one step nearer to the conception of nature as inviting us

> "To that cathedral, boundless as our wonder,
> Whose quenchless lamps the sun and moon supply;
> Its choir the wind and waves, its organ thunder,
> Its dome the sky."

And happy will it be for us when a better acquaintance with the workings of nature shall be so widespread as to make all of us respond to the invitation of Wordsworth to "come forth into the light of things," and to let nature be our teacher.

Not One-Sided.—Let it not be thought that Lord Avebury would, like Herbert Spencer, have a curriculum that is science, and nothing but science. He pleads for a place for science because it trains the reason and fires the imagination, because it fashions as well as forms, because it feeds as well as fires the mind; but he is equally eloquent in praise of literature, and quotes approvingly the old English song:—

> "Oh for a booke and a shadie nooke,
> Eyther in door or out;
> With the green leaves whispering overhead,
> Or the street cryes all about;
> Where I maie reade all at my ease,
> Both of the newe and old:
> For a jollie good booke wherein to looke
> Is better to me than golde."

Nor does he forget the claims of other subjects: music, for example, receives special commendation, and physical exercise is warmly recommended. It is true that Greek and Latin are warned off, but it is because of the incompleteness of the study of these subjects, in consequence of which "our sons leave college unable to speak either Greek or Latin, and too often absolutely without any interest in classical history or literature."

What a Boy or Girl should know at Fourteen.—Here is the curriculum advocated by Lord Avebury and Sir M. E. Grant-Duff. They should be expected to "read aloud clearly and agreeably, to write a large distinct round hand, and to know the ordinary rules of arithmetic, especially compound addition—a by no means universal accomplishment; to speak and write French with ease and correctness, and have some slight acquaintance with French literature; to translate *ad aperturam libri* from an ordinary French or German book; to have a thoroughly good elementary knowledge of geography, under which are comprehended some notions of astronomy—enough to excite his curiosity; a knowledge of the very broadest facts of geology and history—enough to make him understand, in a clear but perfectly general way, how the larger features of the world he lives in, physical and political, came to be like what they are; to have been trained from earliest infancy to use his powers of observation on plants, or animals, or rocks, or other natural objects; and to have gathered a general acquaintance with what is most supremely good in that portion of the more important English classics which is suitable to his time of life; to have some rudimentary acquaintance with drawing and music."

To effect this, as Lord Avebury agrees, would require both industry and intelligence; but he will be a bold teacher, none the less, who objects to any item contained in this common-sense enumeration of school subjects.

Methodology.—So much for the matter, but, it may be asked, what of the method? Our reformer is not silent upon this important point. He is all against the apotheosis of memory, and all in favour of the training of the understanding. "Our great mistake in education," he says, "is, as it seems to me, the worship of book-learning—the confusion of instruction and education. We strain the memory instead of cultivating the mind. The children in our elementary schools are wearied by the mechanical act of writing, and the interminable intricacies of spelling; they are oppressed by columns of dates, by lists of kings and places, which convey no definite idea to their minds, and have no near relation to their daily wants and occupations; while in our public schools the same unfortunate results are produced by the weary monotony of Latin and Greek grammar. We ought to follow exactly the opposite course with children—to give them a wholesome variety of mental food, and endeavour to cultivate their tastes, rather than to fill their minds with dry facts. The important thing is not so much that every child should be taught, as that every child should be given the wish to learn. What does it matter if the pupil knows a little more or a little less? A boy who leaves school knowing much, but hating his lessons, will soon have forgotten almost all he ever learnt; while another who had acquired a thirst for knowledge, even if he had learnt little, would soon teach himself more than the first ever knew. Children are by nature eager for information. They are always putting questions. This ought to be encouraged. In fact, we may to a great extent trust to their instincts, and in that case they will do much to educate themselves. Too often, however, the acquirement of knowledge is placed before them in a form so irksome and fatiguing that all desire for information is choked, or even crushed out; so that our schools, in fact, become places for the discouragement of learning, and thus produce the very opposite effect from that at which we aim. In short, children should be trained to observe and to think, for in that way there would be opened out to them a source of the purest enjoyment for leisure hours, and the wisest judgment in the work of life."

Continuation Schools.—Sir John Gorst, in his stepmotherly treatment of Evening Continuation Schools, would receive scant sympathy from Lord Avebury, for he rightly advocates—remembering, without doubt, his own case—that education should not cease when school is left. "If well begun there," he says, "it will continue through life;" and to the intent that this should be the case, he pleads for the possession of a "special interest," or hobby, which shall be a consolation in times of anxiety, suffering, or sorrow.

Conclusion.—Much more might be added in support of our contention that the educational zeal of our banker-reformer is as sound as it is warm; that he has just as much grip and grit with respect to the school as he has with respect to the counting-house; and that it would be good for England if this man of affairs could be in the place of those who control the destinies of primary and secondary education in our country. But although we have not exhausted our subject, we have exceeded our space, and so, commending the doctrine of our genial reformer to practical teachers throughout the world, we reluctantly place our pen aside.

OUR CLASSROOM AIDS.

WELL-KNOWN TEACHERS AT WORK.

MR. ALFRED FLAVELL,

YARDLEY ROAD BOARD SCHOOL, BIRMINGHAM.

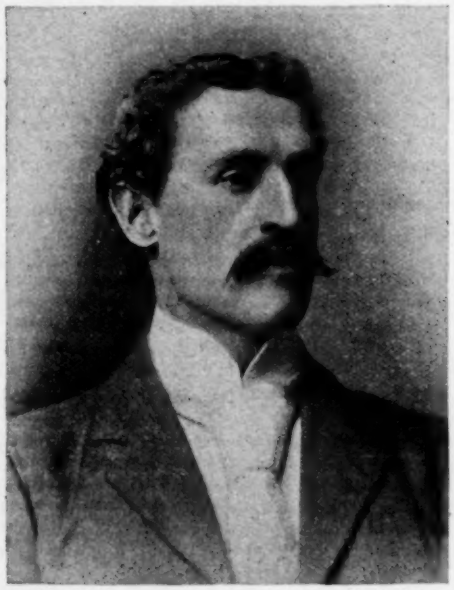
THE subject of our article on "Well-known Teachers at Work" this month is Mr. Alfred Flavell, one of the most widely known and highly thought of teachers in the Midlands.

After half an hour's ride in a cumbersome, unwieldy, and jolting steam tram, and five minutes' delightful walk in a fairly pleasant suburb, we found him in one of Birmingham's best and most palatial schools. He looked, as we should like to see all masters, exceedingly comfortable and in every respect "at home." The day was hot—scorching hot—and he was attired as befitted the day, and appeared beautifully cool. The sight of his flannels made one wish they were more generally worn than is usual in the profession, at least *in school*.

Coolness is evidently one of Mr. Flavell's characteristics. When asked for an interview, for the purpose of publication in THE PRACTICAL TEACHER, it was readily granted, and entered into with the spirit that is born of a man who is master of every detail of his work, and knows how to marshal his wide and extensive array of lore. After a chat on educational development in a general way—a subject we will return to before the article is finished—we made a tour of the school.

It is comparatively a new structure, and after a use of little more than three years it looks as clean and fresh as it did on the opening day in November 1898. There is scarcely a scratch on the fittings and apparatus. Everybody concerned takes a pride in keeping up the newness of everything around. The caretaker is a gem. He examines the children's desks night after night, and polishes them up as though they were the only things in the world worth caring for. The master and staff are thus ably assisted in their great desire for freshness and purity. Nor is this all. The school is situated on an eminence in quite a new district. In former years one of the most famous painters Birmingham has produced—Henshaw—resided near where the school is built; indeed, the district round is known as the Henshaw estate. The artist died, and almost immediately the grounds of his house were cut into for building purposes. His house stands yet, for a year or two longer, and may be seen from one of the classroom windows.

Mention is in this way made of the artist because in the hall of the school, turn whichever way you will, one is reminded of the artist's spirit. It is a "school beautiful." Illustration No. 1 is a view of the master's end. There stands his desk, and round about are objects of interest and delight. When the children are gathered together, every eye is turned to this educative, this inspiring, this enthralling end. They know what they are looking at, too—the names of the busts, the titles of the pictures, and the reason for the general arrangement of the whole. On the side walls are pictures, many of which have been executed by the children, and cabinets containing object-teaching specimens, and at the other end two large museums fairly filled with objects that are likely to be wanted in the "Lesson" teaching of the school. The walls are coloured a light blue shade, and as every picture is a framed one, the general effect is charming. The children are growing accustomed to artistic arrangement and a refined taste in decoration. The busts have been selected with much care, and have been purchased entirely from funds got together by the efforts of teachers and scholars and their parents. There are in all nine—three of



Photograph by] MR. ALFRED FLAVELL. *[W. Woollaston.*

the ancients and six of famous Englishmen—Apollo Belvedere, Venus de Milo, Diana, Shakespeare, Milton, Byron, Scott, Burns, and Sir Isaac Newton.

The hall of the school is an extensive one. It is primarily intended, as are all the halls of the Birmingham schools, for the assemblies of the children and the teaching of one class. It is found, however, impracticable to reserve the hall for one class only. To keep up the average of the school to the

school's accommodation, two classes at least must be taught in the hall.

Here, this morning, are classes which correspond to Standards VI. and VII. We are glad to note that the use of the term "standard" is being gradually dropped. It is dying hard, for in conversation it is heard occasionally; but dying it surely is, and when it is quite as dead as Queen Anne

VIEW IN THE HALL OF THE SCHOOL.

nobody will rejoice more than ourselves. The number in the two classes is considerable, for the room appears to be literally full. The desks are arranged at a good distance apart, for the lessons—brush drawing—require it. And this it is that gives the impression of fullness. The huge class is admirably managed by Mr. Tipper, the senior assistant. Many of the Birmingham schools have made considerable progress in this particular branch of work, and from what we have seen we should not hesitate to class the work done at the Yardley Road School amongst the very best of the city. Mr. Flavell has been particularly fortunate in this matter. In addition to his being himself an ardent lover of what is beautiful and artistic, he has had on his staff men who have been qualified as art teachers. They have set the standard for the rest of the staff, and in this way have done the school untold good. We watched the boys and girls as the work progressed, and were amazed as well as charmed at its excellence. Illustration No. 2 is an example of one kind of work done. The ground is black, and the forms are worked in with Chinese white. There are no pencil lines as guides except those done in the geometrical arrangement of the design. This is where the educational value of brushwork comes in: balancing and truthfulness of form are the result of eye-training, with skill in the manipulation of the flexible point. Mr. Flavell is a firm believer in the freehand outline, and not until a boy (or girl) is proficient in this respect is he (or she) allowed to do much with the brush. Some of the freehand shown is remarkably good. The piece of work shown in the illustration was done last year to be sent to the exhibition of art at Fribourg; but, as in the case of other schools in the city, for some reason or other it never found its way there. It was done by children at the age of twelve—a really fine performance.

It is delightful to see so large a staff all working harmoniously together for the general good of the school. This is the result of the influence exerted by Mr. Flavell. His plans are systematically laid before the staff, and uniformity in methods of teaching and work is apparent in all the classes. One of the points that come boldly to the front is the free and extensive use of the wall-blackboards. They are made of a black concrete, and form part of the wall itself. As the desks for the children are in tiers, it is necessary for the blackboards to be low. This is an advantage, and the tops can easily be reached without a strain. Every oral lesson is illustrated in a permanent (for a year) manner. Take, for example, the illustrations on the blackboard of Class V. (Standard III.). The blackboard goes across the whole front wall. On the right are sixteen illustrations of the science lessons. These are drawn and numbered as the lessons are given. Their use is apparent. They are reminders in spare moments of what has been taught. They form topics of conversation in lessons on oral composition, and so forth. To the left of these is a drawing illustrating the history lesson. The archer with his long bow is a reminder of the prowess of the Englishman at Crecy. The way in which he draws the string tells of the strength he puts into his shot. The plume is one of the trophies of the Black Prince. In the centre are sketch-maps of the geography lesson, while on the left are illustrations of the recitation that is being studied for the year. Did we not know that the illustrations were constantly in use, we should be inclined to say they were too elaborate, and that much valuable time was being spent on them that might be used for other and better purposes. But their use is far-reaching. The cultivation of good taste is ever prominent, while the practice they afford in oral composition is invaluable. The writer spent a very profitable quarter of an hour in judging the value of this latter use. An illustration was selected—No. 9 in science. The subject is condensation of water. At a word from the teacher, Mr. Chatterly, the artist of his college for his year, a boy began somewhat as follows:—

"The illustration we see before us is a reminder of a lesson we had some time ago on the condensation of water. It was a very interesting lesson, and we learned a good deal from it. In the first place, the teacher fixed up the apparatus."

Then he was stopped, and another boy continued:—

"First he arranged the jar containing the spiral tube; and when he was satisfied that it would work as he wished, he joined a tube from the top of it to another flask, which he also arranged on a stand. A cup was placed under the spiral tube."

Then another boy in quite a different part of the class followed:—

"What the cup was for we learned afterwards. By-and-by teacher mixed some dirt into some clean water and put it into the flask. Then he lit a Bunsen burner and put it under the flask which contained the dirty water."

Another:—

"In a little while the dirty water in the flask began to bubble, and we noticed that the tube leading from one flask to the other became moist, and, as we watched, the moisture seemed to find its way into the spiral tube."

Another:—

"Then drops of water were seen to fall into the cup."

Another:—

"When this had gone on for some time, teacher took away the Bunsen burner, and brought us the water in the cup to look at. He asked us to notice what difference there was between the water he was showing us and that in the flask."

Another:—

"The water in the cup was quite clear, fit to drink, and we were asked why it was clear and not dirty. It took us some time to tell, but we know now that the water in the flask was turned to vapour, then condensed into water again, and the soil was not."

Thus was oral composition brought from the children. The picture on the board was the means of refreshing their memories, and they performed the experiment, or, at any rate, thought it over every time they looked at it. To be perfectly fair, the writer does not wish it to be understood that the composition from the children, spontaneous as it was, was quite as fluent and as readily produced as reading it would suggest; but it was genuine and good, an eye-opener as to what can be done by constant care and splendid teaching. No wonder that pages and pages of foolscap can be covered with readable matter in good form by boys and girls of from nine years old upwards. It comes as naturally to them as talking to each other in their ordinary everyday life.

A lesson in history was revised in very much the same way, and a good piece of oral composition was produced by several girls one after the other on "Gunpowder Plot."

In most of the Birmingham schools the teaching of science is conducted and supervised by Mr. W. Jerome Harrison, the Board's special science teacher. The lessons are given by his special staff by means of apparatus carried from school to school. The teachers then repeat the lessons, and the children afterwards reproduce them on paper for the next visit of the special teacher. These visits occur weekly or fortnightly, according to arrangements made at the commencement of the school year. The system is known as the "peripatetic system," and in its way much good has been done. A few years ago the Board granted to the head teachers who desired it permission to teach their own science, based on their own schemes which were approved, and illustrated by their own apparatus, which was kept at school. In this way the disadvantage of repeating a lesson *without apparatus* was removed. This privilege Mr. Flavell seized when he opened the Yardley Road School, and a commodious laboratory was fitted up with a complete set of chemical and physical apparatus. His teaching has been a complete success. He is enabled to draw up science schemes which are continuous and connected from the lowest class to the highest. He finds that the teachers are willing to spend time on the preparation of lessons and the pre-performing of the necessary experiments. These are turned to good account in the teaching. The laboratory is well kept, and is an exceedingly useful adjunct to the school.

In a school of this character time flies with a rapidity which is little dreamt of, and the tour of the classrooms being ended, there was only time left to hear just one more lesson—a lesson in French to the First Class. This class corresponded to Standard VII., and consisted of some thirty boys and girls. The teacher, Miss Bakewell, has had the good fortune to reside in France for a considerable time, and consequently she knows the language fairly perfectly, and can teach it really well. The first part of the lesson consisted of conversation, the words used being the names of things round about or which could easily be procured, and verbs, adjectives, adverbs, and phrases in common everyday use. Such sentences, for example, as the following were made by teacher and scholars alternately:—

Teacher. Que tiens-je dans la main?

Scholar. Vous tenez un crayon dans la main.

Teacher. Où ai-je mit le crayon?

Scholar. Vous avez mit le crayon dans la boîte.

Teacher. Combien de crayons pouvez-vous voir à ce moment dans la main?

Scholar. Je puis voir à ce moment deux crayons dans la main.

Teacher. Les crayons où sont-ils?

Scholar. Les crayons sont dans la main derrière le dos.

Teacher. Vous, mademoiselle, quel âge avez-vous?

Scholar. J'ai douze ans.

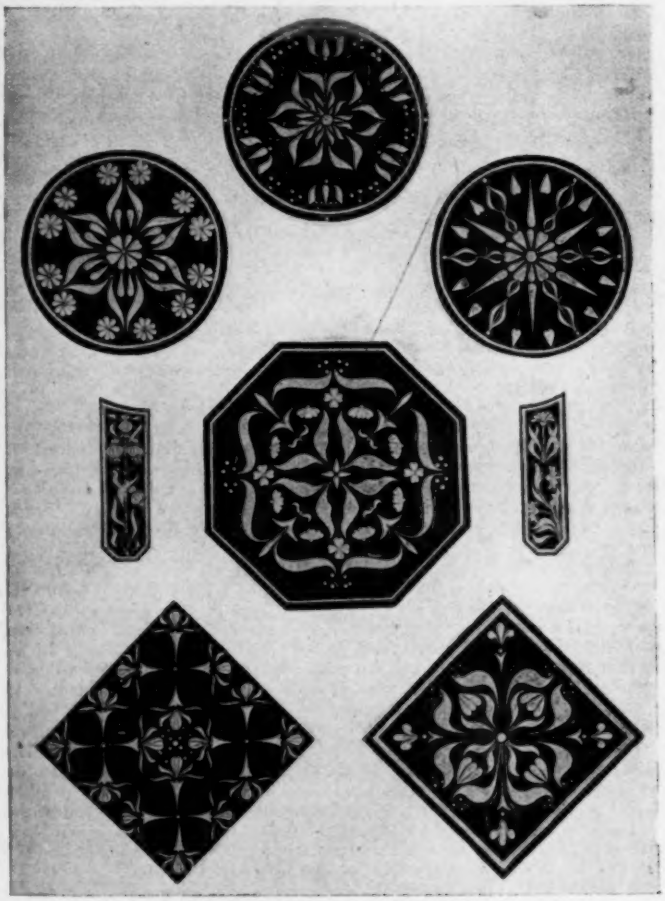
Teacher. Très bien, mademoiselle.

Toute la classe, tournez à page dix dans le livre.

Page 10 of the reading book in use was found, and "Vous, monsieur, commencez à lire," was the signal for each scholar to read a passage in turn. The reading was as fluent and correct as could be expected, and the accent showed that a good grip of French pronunciation had been got. Both teacher and children are to be highly congratulated—the one for her painstaking and up-to-date teaching, the others for their diligence and attention to work at what is always in elementary schools, even under the best tuition, a very difficult subject.

Geography is taught in an equally intelligent and up-to-date way. The school possesses a magic-lantern, bought from concert proceeds. One of the classrooms is fitted with removable dark blinds, and into it the classes go for an exhibition once a month. The lessons which have been given in the ordinary course are illustrated, and revised, and amplified. A large number of slides is at hand, and from week to week Mr. Flavell adds to his stock. He is a photographer of no mean order, and the slides he makes are well selected and clearly executed. The blackboards of the classrooms are used for sketch-maps, and all are done with the greatest care. Those in the rooms used by Class VI. (Standard II.) are very elaborate indeed—splendid land and sea views—and drawn with considerable skill. There are also in use several geographical models in colour.

As a treat to the writer, he was promised an assembly of the whole school. The signal for the same was given by means of electric bells, which were connected from each classroom to the wall behind the master's desk. First of all there came in response to the call a girl from Class II. She took her place at the piano, and the pause of about a minute was used in learning that the girls of the school who can play a march sufficiently well are allowed to do so in turns, each taking duty for two days. A list of such girls is kept in a convenient place, and the system works admirably.



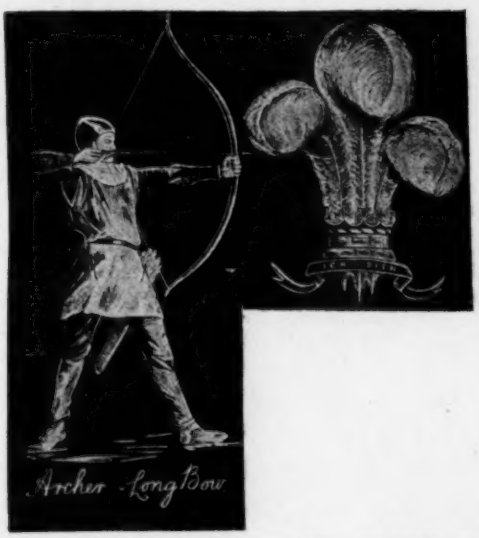
BRUSHWORK DESIGN (BOYS AGED TWELVE).

An assembly of some seven hundred children, each bent on doing the correct thing at the correct moment, is a very impressive and inspiring sight, and this assembly was exactly so. The children came and stood at their accustomed places in excellent style, and were glad to see the approval of Mr. Flavell as he watched them from his stand at the desk.

Then, when all were in and dead silence prevailed, what they had come for was soon known. Mr. Flavell invited the children to listen to a simultaneous rendering of "Horatius" by the First Class. This was thoroughly and keenly appreciated. The reciters knew the reputation they had to sustain, and the listeners were eager to catch the meaning of the whole of the exercise. It was an excellent pattern to the rest of the school, and one can easily understand that the fame the school has acquired in the matter of concert-giving is justly meted out. At the morning assemblies a piece is played for a few minutes on the piano by one of the staff, and this exercise is used as a means of musical training.

It is points such as these that show how up-to-date Mr. Flavell and his staff are in school work. They perceive that a child's school life must not be merely a humdrum of rigid routine. It must be mingled with as many beauties as the mind of man can suggest and devise. The eye and the ear must be accustomed to the very best influence, the tone of everything around must be uplifting and strengthening in a moral sense, and only what is good must prevail and have a place in the community of school.

With the exception of a two years' training at the Borough Road College (1885–86), Mr. Flavell has acquired his professional skill entirely in Birmingham. He was apprenticed in the Severn Street British School, and after leaving college



HISTORY—BLACKBOARD DRAWING, CLASS V. (STANDARD III.).

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One might have printed forms like this :—

St. James's National School, Ipswich
(Boys' Department), June 30, 1902.

DEAR SIR OR MADAM,—Herewith I beg leave to submit for

A lesson in history was revised in very much the same way, and a good piece of oral composition was produced by several girls one after the other on "Gunpowder Plot."

In most of the Birmingham schools the teaching of science is conducted and supervised by Mr. W. Jerome Harrison, the Board's special science teacher. The lessons are given by his special staff by means of apparatus carried from school to school. The teachers then repeat the lessons, and the children afterwards reproduce them on paper for the next visit of the special teacher. These visits occur weekly or fortnightly, according to arrangements made at the commencement of the school year. The system is known as the "peripatetic system," and in its way much good has been done. A few years ago the Board granted to the head teachers who desired it permission to teach their own science, based on their own schemes which were approved, and illustrated by their own apparatus, which was kept at school. In this way the disadvantage of repeating a lesson *without apparatus* was removed. This privilege Mr. Flavell seized when he opened the Yardley Road School, and a commodious laboratory was fitted up with a complete set of chemical and physical apparatus. His teaching has been a complete success. He is enabled to draw up science schemes which are continuous and connected from the lowest class to the highest. He finds that the teachers are willing to spend time on the preparation of lessons and the pre-performing of the necessary experiments. These are turned to good account in the teaching. The laboratory is well kept, and is an exceedingly useful adjunct to the school.

In a school of this character time flies with a rapidity which is little dreamt of, and the tour of the classrooms being ended, there was only time left to hear just one more lesson—a lesson in French to the First Class. This class corresponded to Standard VII., and consisted of some thirty boys and girls. The teacher, Miss Bakewell, has had the good fortune to reside in France for a considerable time, and consequently she knows the language fairly perfectly, and can teach it really well. The first part of the lesson consisted of conversation, the words used being the names of things round about or which could easily be procured, and verbs, adjectives, adverbs, and phrases in common everyday use. Such sentences, for example, as the following were made by teacher and scholars alternately :—

Teacher. Que tiens-je dans la main ?

Scholar. Vous tenez un crayon dans la main.

Teacher. Où ai-je mit le crayon ?

Scholar. Vous avez mit le crayon dans la boîte.

Teacher. Combien de crayons pouvez-vous voir à ce moment dans la main ?

Scholar. Je puis voir à ce moment deux crayons dans la main.

Teacher. Les crayons où sont-ils ?

Scholar. Les crayons sont dans la main derrière le dos.

Teacher. Vous, mademoiselle, quel âge avez-vous ?

Scholar. J'ai douze ans.

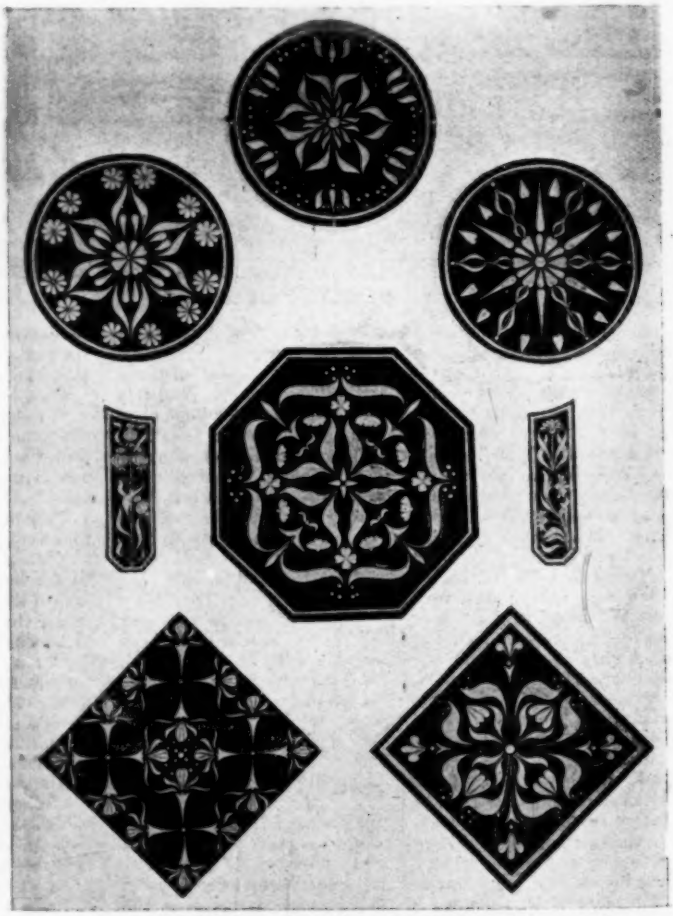
Teacher. Très bien, mademoiselle.

Toute la classe, tournez à page dix dans le livre.

Page 10 of the reading book in use was found, and "Vous, monsieur, commencez à lire," was the signal for each scholar to read a passage in turn. The reading was as fluent and correct as could be expected, and the accent showed that a good grip of French pronunciation had been got. Both teacher and children are to be highly congratulated—the one for her painstaking and up-to-date teaching, the others for their diligence and attention to work at what is always in elementary schools, even under the best tuition, a very difficult subject.

Geography is taught in an equally intelligent and up-to-date way. The school possesses a magic-lantern, bought from concert proceeds. One of the classrooms is fitted with removable dark blinds, and into it the classes go for an exhibition once a month. The lessons which have been given in the ordinary course are illustrated, and revised, and amplified. A large number of slides is at hand, and from week to week Mr. Flavell adds to his stock. He is a photographer of no mean order, and the slides he makes are well selected and clearly executed. The blackboards of the classrooms are used for sketch-maps, and all are done with the greatest care. Those in the rooms used by Class VI. (Standard II.) are very elaborate indeed—splendid land and sea views—and drawn with considerable skill. There are also in use several geographical models in colour.

As a treat to the writer, he was promised an assembly of the whole school. The signal for the same was given



BRUSHWORK DESIGN (BOYS AGED TWELVE).

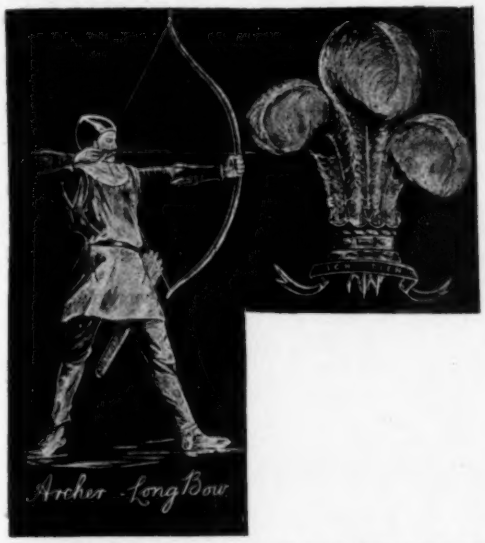
by means of electric bells, which were connected from each classroom to the wall behind the master's desk. First of all there came in response to the call a girl from Class II. She took her place at the piano, and the pause of about a minute was used in learning that the girls of the school who can play a march sufficiently well are allowed to do so in turns, each taking duty for two days. A list of such girls is kept in a convenient place, and the system works admirably.

An assembly of some seven hundred children, each bent on doing the correct thing at the correct moment, is a very impressive and inspiring sight, and this assembly was exactly so. The children came and stood at their accustomed places in excellent style, and were glad to see the approval of Mr. Flavell as he watched them from his stand at the desk.

Then, when all were in and dead silence prevailed, what they had come for was soon known. Mr. Flavell invited the children to listen to a simultaneous rendering of "Horatius" by the First Class. This was thoroughly and keenly appreciated. The reciters knew the reputation they had to sustain, and the listeners were eager to catch the meaning of the whole of the exercise. It was an excellent pattern to the rest of the school, and one can easily understand that the fame the school has acquired in the matter of concert-giving is justly meted out. At the morning assemblies a piece is played for a few minutes on the piano by one of the staff, and this exercise is used as a means of musical training.

It is points such as these that show how up-to-date Mr. Flavell and his staff are in school work. They perceive that a child's school life must not be merely a humdrum of rigid routine. It must be mingled with as many beauties as the mind of man can suggest and devise. The eye and the ear must be accustomed to the very best influence, the tone of everything around must be uplifting and strengthening in a moral sense, and only what is good must prevail and have a place in the community of school.

With the exception of a two years' training at the Borough Road College (1885–86), Mr. Flavell has acquired his professional skill entirely in Birmingham. He was apprenticed in the Severn Street British School, and after leaving college



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St. James's National School, Ipswich
(Boys' Department), June 30, 1902.

DEAR SIR OR MADAM,—Herewith I beg leave to submit for

your consideration the annual report upon the behaviour, attendance, and general progress of your son during the past twelve months.

I invite you to assist me in my endeavour to promote your son's welfare by sending him regularly and punctually.—I am, yours faithfully, JOHN SMITH.

Overleaf the following might be printed:—

Report.

Conduct.—
Attendance.—
Written exercises.—
Oral work.—
Manual subjects.—
General remarks.—

(Signed) ——, Class Teacher.
——, Head-Master.

The class teacher could then fill in all particulars.

Again, I would inform every parent, at least three times per annum, as to the number of absent marks which stand against his child. This might be done by sending post cards or notes, or the number might be sent verbally as a message carried by each scholar. Personally I should say the best effect would result from a note being sent.

I should encourage the parents to call during school hours on a stated day in the quarter to see what was going on. The more the teacher can get into touch with the child's environment, the better will he be able to deal intelligently with the individual. We are fast approaching a system wherein it will be more than ever necessary to possess a history of the individual scholar. Which is the more important fact bearing upon the training of any lad—to know that he is eight years of age, or that he comes to school frequently without breakfast? In my opinion, unquestionably the second fact is the more important to be known. We must, if we would be successful teachers, obtain as much information as possible relative to the child's surroundings. To do this we must get into touch with the parents.

The Financial Clauses of the Education Bill.

One effect of the new Bill, if passed, will probably be to place the teachers more under local inspection and less under the control of Government inspectors. It has long been thought that the Board of Education is desirous of getting much of its routine work done by the local authorities. In that case the Government inspectors would form a kind of advisory body to keep the counties in touch with the central executive. The work done by them in the past would then be performed by local authority inspectors. A system of appointing special superintendents would probably arise.

The latest development, whereby a much larger sum of money is to come from the Treasury, will, peradventure, incline the Government to make arrangements for a continuance of full control by their officials.

A Letter to Carnegie on Education.

A clever Brooklyn wit has addressed an open letter to Mr. Andrew Carnegie on the school question. He complains of "the lack of high and definite purpose for the activity of schools," and says "the teachers are not unlike galley slaves, each swinging in his restricted space without knowing whither the vessel is bound."

Further on this satirist proceeds: "The current method of setting forth arithmetic, geography, etc., as the essentials of school procedure, while failing to show why these things are part of education and what part of education they should be, seems to me like directing the workmen in your mills to run the rolls, the hammers, and the shears without telling any one, or, in fact, knowing yourself, what is to be constructed."

He suggests the following curriculum:—

CARNEGIE COURSE OF STUDY.

THINKING DEPARTMENT.

Cultivating the senses, cultivating the memory, cultivating the imagination, exercises in abstract ideas, exercises in judgment, exercises in reasoning.

FEELING DEPARTMENT.

Cultivation of appreciation of beauty, exercise in humour, pathos, etc.; cultivation of love of order, love of work, of knowledge, of law, of country, of humanity, of truth, of right, of duty, of God.

WILLING DEPARTMENT.

Cultivation of attention, exercise of patience, cultivation of promptness, of accuracy, of speed, of persistence, of self-control, of courage.

PHYSICAL DEPARTMENT.

Cultivation of health, of strength, of grace, of bodily control.

INFORMATION DEPARTMENT.

History (mankind science), geography (earth science), physics (force science), physiology (life science). Add such other knowledge as is employed as the basis of the exercise in the thinking, feeling, willing, and physical departments.

THE "NOTEBOOK" QUERY COLUMN.

Letters intended for this column should be addressed "Inspector," care of Editor, PRACTICAL TEACHER. Only in very urgent cases can replies be sent by post, and then only when two stamps accompany the letter.

A.K. asks whether there are any statistics available as to the results of the King's Scholarship Examination.

Answer.—Yes; you can find what you require in Volume II. of the Board of Education Blue Book. In 1900 there were 10,822 examined: 2,130 passed first class, 3,850 passed second class, 3,907 third class, and 935 failed.

J.T. thinks of starting Horticulture, and desires information as to how to proceed.

Answer.—Procure the Board of Education's recent pamphlet on Gardening, and read the articles on the subject in the volumes of special reports issued by the Board of Education. Some of the county councils are interesting themselves in this subject. Drop a line to the clerk of the West Riding County Council. I believe he can supply you with some valuable information.

Inquirer asks whether she is at liberty to arrange for more than fifteen minutes for recreation.

Answer.—Read carefully Article 12 (*h*) of the Code.

A.A.—Send coupon and two stamps for reply by post.

A.D.P.—Registrar, University of London, Imperial Institute, London.

OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK.

EGYPT.

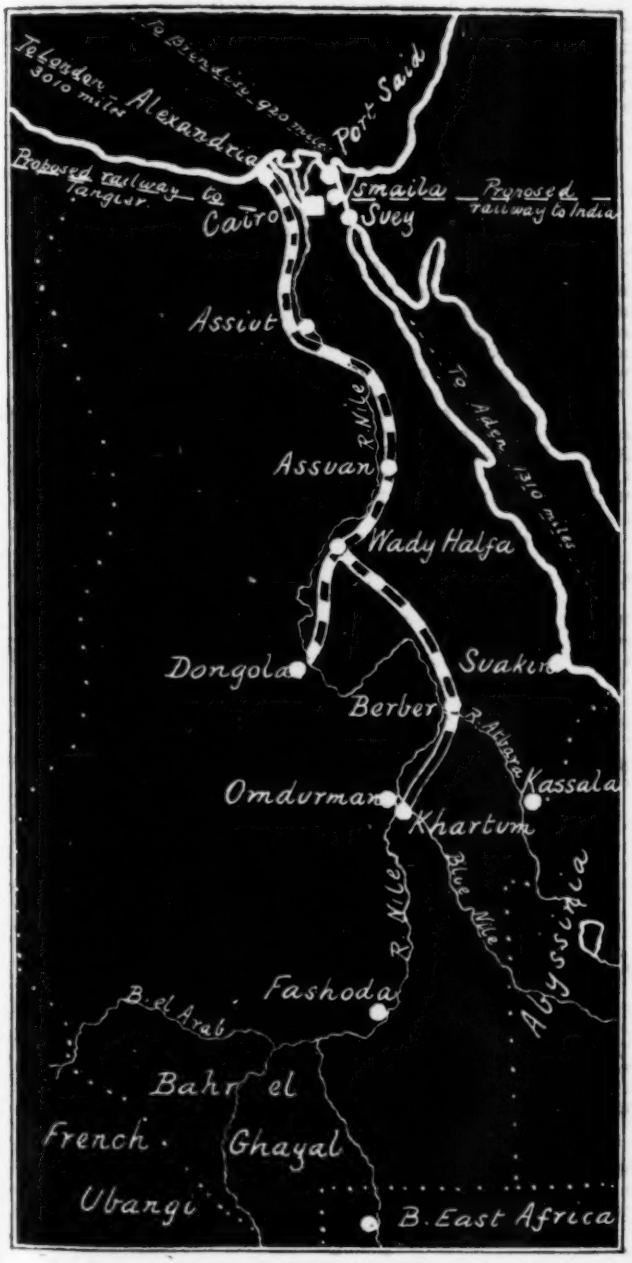
What the British Occupation is doing for the Ancient Kingdom.

As evidence of the marked capacity of the British for colonisation and successful methods of extending the benefits and blessings of civilisation, no finer example is afforded us than that of the land of the Pharaohs.

For centuries Egypt had been subject to Turkey, and bore evidence of all those forms of corrupt government of which Ottoman rule is capable. Mehemet Ali, who was appointed governor in 1806, took up arms against the Sultan, and became absolute master of the country. It comes within the scope of the present article, however, only to briefly describe the main events that led to the British occupation.

Ismail Pasha succeeded to the throne in 1863. The early years of his reign were marked by successful administration and a very considerable extension of the Egyptian dominions. By 1875 the territory was not less than 1½ million square miles, with a population of 16,000,000. Ismail, by his policy of conquest and annexation, created a position he was not strong enough to fill. Mismanagement was followed by financial embarrassment, the government could not keep its engagements, and eventually Ismail abdicated at the in-

stigation of Great Britain and France, whose chief object was to place Egyptian finance upon a sound footing. Mohammed Tewfik succeeded his father; but even if he possessed the capacity, he lacked the opportunity of improving the position. In 1882 a military revolt took place under the leadership of Arabi Pasha. Anxiety for the safety of the Suez Canal caused the British Government to dispatch an expedition to Egypt, France refusing to co-operate. The rebellion spread to the Sudan provinces, where a rebel sheik proclaimed himself "Mahdi." General Gordon fell at Khartum, and for some years it was hopeless to expect to restore the authority of the Khedive. Then commenced a long period of preparation. The Egyptian army was encouraged and trained to a high pitch of excellence, and finally Lord Kitchener, by a series of brilliant military movements, utterly annihilated the power of Mahdism.



During these years internal reforms in the administration of the country had been steadily effected, and the conclusion of the military operations gave the British still further opportunities of carrying out their beneficent work, the more prominent features of which we shall briefly describe.

Financial Reform.—Though Egypt is still nominally a province of the Ottoman Empire, the Sultan has little hold over the country beyond the exaction of an annual tribute of about £665,000. British influence is seen in the appointment of an English financial adviser, who has a seat in the Council of Ministers, and whose consent is necessary to ratify all financial decisions. The following figures show the great improvement that has taken place:—

Year.	Revenue.	Expenditure.
1879.....	£8,500,000.....	£10,500,000
1898.....	11,131,000.....	9,800,000
1900.....	11,447,000.....	9,895,000

Fighting the Desert.—But for the bounteous Nile, the hungry desert would speedily absorb Egypt. The river is practically the only thing to which the country can look for any increase in her material wealth. The cry of the country is for water, and water spells riches to the agricultural population, which accounts for over 60 per cent. of the whole. The Irrigation Department has already worked wonders in improving many of the ancient irrigation channels, but the great barrage and reservoir works at Assiut and Assuan, now approaching completion, are among the most remarkable engineering feats the world has yet seen. For a full description of the works we must refer our readers to THE PRACTICAL TEACHER (April 1900), but it will be well to repeat what it is hoped the operations will effect. At a cost of about £5,000,000 water will be provided for 500,000 acres of land, to say nothing of a general improvement in the existing supply. The extra revenue from the additional fertile area is calculated at £400,000 per annum, out of which has to be paid annual instalments of £166,666 for thirty years to pay the cost of construction. Here is another great factor in saving Egypt from bankruptcy and ruin.

Sanitation.—Formerly the Egyptian claimed the right to die how and where he liked. Sanitary reform is particularly difficult in a Moslem country, where any interference with the customs and religious observances of the people is liable to meet with bitter resentment. It is claimed that during a vigorous campaign against cholera in 1895–96 quite 80,000 lives were saved by the efforts of the Sanitary Department. Not only has the drainage of the mosques been diverted from contaminating the local water supplies, but improvements have even been effected in the vessels used in the Moslem services. It is customary for the devout worshipper to wash out his mouth before engaging in prayer. For this purpose a *médah*, or ablution basin, is provided, and it was by no means uncommon to find hundreds and even thousands of persons using one vessel without the water being changed. It is perhaps impossible to conceive a more potent means for the propagation of disease. In many mosques taps and reservoirs have taken the place of the loathsome *médah*.

The disposal of dead bodies has also received attention, and persons are no longer allowed to bury their dead almost at their very doors. The introduction of European medical practices at first met with all the opposition of which ignorance, superstition, and inborn prejudice were possible. But the Egyptian has noticed the results, and now lends a willing ear to advice. The hospital has ceased to be a hateful institution, into which the native entered with positive abhorrence. It is, however, strange how native practices still exist alongside of enlightened methods. The native nurses hasten to cover

their faces at the approach of the doctor; and outside the building may be seen the professional wailers, hopefully awaiting the death of patients that they may practise their calling.

The Suez Canal.—The canal was opened in 1869. It cost about £20,000,000. Half the capital was raised in Europe—very largely in France—and the remainder was provided by the Khedive. In 1875 the British Government bought the Khedive's shares (176,602 out of a total of about 400,000) for £3,976,582. Their present value is estimated at £24,000,000, and in 1900 the interest and dividends upon them amounted to £800,000. From the commencement the canal proved an ever-increasing success. In 1870, 486 vessels of 655,000 tons passed through it; in 1900 the number was 3,441 of 13,700,000 tons, and of these 1,935 of 7,771,000 tons were British. The value of the Suez Canal as a link in our route to the East is incalculable.

French Interests in Egypt.—France acted jointly with Great Britain in 1879; but refusing to do so in 1882, she ceased to be an important factor in Egyptian politics. She has at various times chafed under the long-continued British occupation, but the exhibition of jealousy has not been allowed to interfere with British aims and aspirations. Major Marchand endeavoured to acquire the Bahr-el-Ghazal for France by an expedition to Fashoda; but this was successfully claimed to be within the British sphere of influence. By an international agreement France is allowed access to the Nile, *viâ* Bahr-el-Ghazal, in return for Britain's access to the Ubangi and Lake Chad.

Commerce.—The commerce of the country has commenced to show a gratifying increase. During the years 1891–98 the total trade did not exceed 23 millions per annum; in 1899 it rose to 27; in 1900, to 30; and in 1901 reached its high-water mark of 31 millions. In 1900 Great Britain took Egyptian exports to the value of £12,585,000, of which over three-quarters was raw cotton; Egypt in return took British produce to the value of £6,000,000, of which nearly one-third consisted of cotton goods.

Conclusion.—In conclusion, let us look back once more to the past. "Before the foundation of Babylon or Nineveh, Egypt was; its pyramids stand at the threshold of all history. When Greece was barbarian and Rome a marsh, in Egypt soothsayers and astrologers were writing treatises on architecture, the stars, and geometry, and building temples and monuments of unparalleled magnificence." After centuries of misgovernment and decay, who can say Egypt, under British tuition, is not entering upon a new era bright with richest promise? The dark chapters in its history may yet be forgotten, and the ancient kingdom once more hold up its head among the great nations of the earth.

NATURE STUDY AND THE NATURE STUDY EXHIBITION.

THIS exhibition, which was recently held in the beautiful gardens of the Royal Botanic Society, was organised for the purpose of bringing together a collection of objects and teaching appliances which would show the present methods of encouraging children to interest themselves in the plants, animals, and other living things which can be found in their neighbourhood.

There can be no doubt that the love of nature has diminished in a very considerable degree during the last quarter of a century, and this is noticeable, not only in the inhabitants of large towns, but also among the rural population. Doubtless the spread of elementary education and the cheap press are important factors in this neglect of nature and nature study. When the book of Nature was the only book that people were able to read, it was studied diligently and profitably; but the hurry of modern life induces many people at the present day to attempt to acquire, by means of text-books, knowledge the acquiring of which afforded their forefathers a life-long pleasure and recreation, thus foolishly swallowing the pips, as it were, and neglecting the apple. With a view to reviving this interest in nature, the Nature Study Association was formed in the early part of the present year, and, very wisely, it seeks to interest teachers of all grades and classes of schools in this subject as the best and surest means of propagating its views; and to this end the present exhibition is being held. Naturally, considering the recent birth of the association, the present exhibition must be regarded somewhat in the nature of an experiment; but we must congratulate the members of the executive, and particularly the hon. secretary, Mr. J. C. Medd, on the successful result of their labours, and we trust that they will be enabled to carry on the work they have so ably begun.

Regarding the meeting, then, as an experiment, one of the most striking features was the evidence given of the many different points of view from which the subject may be regarded. Lord Avebury, as might be expected from the author of *The Beauties of Nature*, dwelt on the æsthetic and moral side of nature study; whilst Professor C. Lloyd-Morgan, in his admirable paper, emphasised its educational value, and strongly condemned those who estimate the value of any branch of education by the £ s. d. that it is likely to bring in in after-life. On the other hand, the Right Hon. R. W. Hanbury, as President of the Board of Agriculture, and Lord Strathcona, as High Commissioner for Canada, both regarded the subject from a strictly utilitarian point of view, urging as their reason for the advancement of nature study the benefits that must accrue to the agriculturist from the intelligent study of the life around him; whilst the Duke of Devonshire, speaking perhaps as a member of the Government rather than as President of the Board of Education, regarded the subject from a political point of view as one that was likely to do much to solve the social problem of the migration of the rural population to the urban districts.

If, then, the association wishes to induce teachers, and particularly elementary teachers, to introduce nature study into their schools, it must set itself to work to bring these various views into harmony with one another, so that there may be no misunderstanding as to what nature study really does embrace. This, as we said before, is particularly important to the elementary teacher; for although the Board of Education allows a large amount of freedom in the choice of subjects, and considerable latitude in the manner in which those subjects are handled, the wellbeing of the school and the reputation of the teacher still depend largely on the report of H.M. Inspector, so, should the latter take a different view of the subject to the teacher, it might result in an unfavourable report on the school. That this is a real and not an imaginary danger is brought home by the paper read by the Inspector to the Leicester School Board, in which he explained the lines on which he himself examined the classes in the Leicester schools in their nature studies. Nothing, we venture to think, is more fatal to true nature study than examinations, however skilfully conducted. By all means let the inspector inquire into the methods adopted by the teacher to inculcate a love of nature in the children, and suggest any alterations or improvements that may appear to him beneficial; but it is as useless to attempt to examine the children themselves, and to judge the results of their nature studies, as it is to attempt to estimate the morality of an individual by means of an examination in Biblical knowledge, and any attempt to do so must inevitably intensify the evil that the association is endeavouring to combat—namely, the use of the cram-book, and the exclusive cultivation of the memory.

The question, then, naturally arises, "What is Nature Study?" The term Nature Study, which has been in use for a considerable time in America, is a comparatively new one on this side of the Atlantic; and although the introduction of the term has much to commend it, still it has one serious disadvantage, for the impression created in the mind of the teacher on meeting the new name is that it represents a new subject to be added to the already overcrowded curriculum. This, however, is not the case; nature study is not a new subject, but simply a more suitable and rational method of dealing with subjects that are already found on the time-tables of most schools. For many years children have been given elementary lessons in natural history, botany, geology, and physiography; but, as a rule, these

subjects have been treated in an academic manner, whereas the object of nature study is to approach them from the child's point of view.

By the old method, the teacher started with a certain amount of information about the subject in hand, and the children represented passive receptacles into which this information had to be poured; the new method recognises and endeavours to utilise the fact that there is in every child an instinctive love of living things, and also an insatiable curiosity to investigate and find out the reason for everything that comes within its experience. Under the old hide-bound system, this curiosity, the most potent factor in the development of the intellect, was snubbed and snuffed out of the child, and any attempt to investigate on any lines except those laid down in the text-books was at once repressed as a useless expenditure of time and energy; whilst the only attempt to satisfy the child's love for living things was to provide it with pictures, diagrams, dried or stuffed specimens, or, in very rare cases, with animals in captivity.

A recent number of *Punch* showed a little girl making a tour of the Zoological Gardens, who remarks, after inspecting the various specimens in their cages, "Oh, but, nurse, are there *really* such funny animals?" Although, when taken in conjunction with Mr. Raven Hill's clever drawing, this is decidedly humorous, it is, nevertheless, a perfectly true and striking illustration of the imperfect conceptions that are formed in the child-mind by presenting nature in an unnatural way. The great aim of nature study is to approach nature from the child's point of view—to encourage him to satisfy his natural curiosity, and to find out as much as possible of the why and wherefore of the phenomena of nature that he sees around him, and to foster his natural love for living creatures, so that he may appreciate the beautiful and wonderful world in which he lives.

It is most essential that this true conception of nature study should be insisted on from the outset. Is main objects should be educational and not utilitarian; the teacher should seek to draw out, direct, and strengthen what is already implanted in the children, and not try to impart to them a certain amount of information to be reproduced, parrot fashion, at the next visit of the inspector, or at the next prize-distribution or open-day of the school. The results of nature study are not to be looked for in the improvement of the agricultural produce of the neighbourhood, although there is no doubt that it will prove of considerable benefit in this respect, but rather in the intellectual and moral elevation of the children. There is no need to dwell upon this elevating influence of nature; it has been reiterated again and again by writers and thinkers in all ages. "God Almighty," says Bacon, "first planted a garden: and indeed it is the purest of human pleasures; it is the greatest refreshment to the spirits of man;" whilst Isaac Walton, in his *Compleat Angler*, sings of

> "The sweet contentment
> The countryman doth find."

The whole matter has been admirably put by Lord Avebury—better known to us, perhaps, under his old title of Sir John Lubbock—who, of course, speaks with the authority of a man who has devoted the greater part of his life to nature study. He says:—"I am often grieved to think how much happiness is lost by my fellow-countrymen through their ignorance of science. No one with a knowledge of science could ever be dull; no one would sit and drink in a public-house if he knew how delightful it was to sit and think in a field; no one would seek excitement in gambling and betting if he knew how much more interesting science was. Science never ruined any one, but is a sort of fairy godmother, ready to shower on us all manner of good gifts, if we will only let her. The study of nature is not only most important from a practical and material point of view, and most interesting, but it will also do much to lift us above the petty troubles, and help us to bear the greater sorrows of life."

Let us consider in what ways this love of nature can best be fostered. In the first place, if the children are to be led along the right paths, the teacher himself must possess a firm belief in the reality and efficacy of this kind of study, and also a strong desire to become personally acquainted with the wonders and beauties of nature. By such a teacher, nature study will be regarded, not as an additional burden upon his already heavily-laden shoulders, but as a genuine source of pleasure and recreation. One great advantage to the teacher is that no special scientific training is required—in fact, a teacher who has specialised in some particular branch of science often finds great difficulty in looking at nature from a general outlook, and his teaching is apt to be more narrow than that of one who approaches the subject as a child does, with a perfectly open mind.

If, however, the teacher is to lead the scholar to know and love nature, it is most essential that he himself should know and love her; but we cannot shut our eyes to the fact that the majority of our teachers are town-bred, and therefore, as might be expected, their knowledge of nature is somewhat limited, and generally derived from books. To remedy this defect, the Board of Education now requires that nature study, both from a practical and experimental point of view, shall be taken as one of the subjects for the Certificate Examination. This, however, does not benefit those teachers who have already gone through their prescribed period of training; but so general is the recognition of the importance of this subject, that already many county councils have taken the matter in hand and arranged courses of nature study for the teachers in their districts, and before long this number, it is to be hoped, will be largely increased.

Speaking on this point, Mr. H. Hobhouse, M.P., gives the following figures:—Twenty-two county councils have been conducting short special courses for teachers, extending over a few weeks, usually in the summer vacations; twenty-four councils have instituted longer and more systematic courses; while twenty-six have arranged, in connection with these courses, outdoor rambles or excursions for teachers.

The following syllabus of the short course conducted by Professor Geddes of University College, Dundee, will serve to illustrate the nature of these courses. This course consisted of six lectures with afternoon excursions.

Lecture I.—Nature Study in Education.

Nature Study as the habit of observing and thinking for oneself and at one's best, without books or helps, in the presence of the facts and in the open air.

Afternoon Ramble.—Beauty of the country—interest in common things, questions they raise.

Lecture II.—The Child in Nature: Observing.

The child naturalist and his treasures; not of labelled and codified lesson-objects, but treasures, wonders, beauty-feasts—for example, crystals, flowers, fruits and seeds, shells and butterflies. The teacher's duty to stimulate the direct personal observation of the pupil.

Afternoon Ramble.—(*a*) The Backs of the Colleges, with mirror and camera.

(*b*) The Art Galleries.

(*c*) Sundown on the river.

Lecture III.—The Child in Nature: The Intelligence at Work.

Child questionings, their encouragement and guidance. Observation and inference; discipline in discriminating between these. The beginning of systematic observation and experiment.

Psychology of truancy; the hunger of nature-experience and the instinct of travel.

Excursion No. 3.—Visit to Museum; Evening, 9.30 P.M., the sky.

Lecture IV.—The Child in Nature: Activity in Work and Play.

Nature of Play. Games and Sports, their educational uses and limitations (for example, Froebel's, the Public School's). Reaction against their exaggeration.

Reformative efficiency (and urgency) of gardening in treatment of "Hooliganism."

Excursion No. 4.—Ramble in the country again.
(*a*) A wood.
(*b*) A harvest field.
(*c*) Some gardens (cottage, market, and mansion).
(*d*) A school garden.

Lectures V. and VI.—Nature Study Methods and Appliances in Detail.

Laying books aside for a time, how can we best set about renewing and enriching our sense impressions of the outer world?

How shall we arrange these toward a better conception of our environment, both immediate and remote?

How can we practically carry on this educational process with our pupils, and by ourselves?

And how can we best begin an ever-deepening study of this and that special aspect and group of things—each special "science"—and yet gain an increasing sense of their unity also?

Turning to the exhibition itself, we are again reminded that the subject is still in an experimental stage, for many of the exhibitors imagine that anything connected with nature, however remotely, is nature study. This is particularly noticeable in the drawing and brushwork. Capital copies of Landseer's "Monarch of the Glen" and "The Cavalier's Pets" were shown; but however good these may be from an artistic point of view, we must point out that copying a reproduction of the work of even such an eminent animal painter as Landseer is not studying nature. On the other hand, there is quite enough good work in the exhibition to show the teacher what can be done, even in city schools, in the way of nature study—work not of the class-room, rule-of-thumb order, but breathing of the open air and bearing evidence of the joy and pleasure that the children must have felt in their tasks—work that shows how carefully the little ones must have watched the living things they tended—work that in many cases indicates great originality on the part of the young students, revealing that spirit of inquiry which must form the basis of all true scientific investigation. Glancing round the benches, we find all classes of schools represented, from Eton and St. Paul's to Poor Law schools; ladies' colleges, orphan schools, agricultural colleges, and Board schools, all united in that kinship wrought by "one touch of nature."

Perhaps the most attractive exhibit is that sent from St. Paul's School, and its value is further enhanced by the fact that it is the unaided work of the boys. Here we see cases of entomological specimens, minerals, and plants, whilst the drawings and diagrams executed direct from the objects themselves show that real solid work is being done. Very interesting, too, are the specimens of plants growing in solutions exhibited by Allen's Girls' School, Dulwich, and the aquaria from the Froebel School.

The exhibits sent by the School Boards of our large towns (London, Liverpool, Manchester, Leeds, etc.) completely refute the allegation that nature study cannot be carried on in urban schools. In most cases, of course, nature has to be brought to the children; but numerous photographs are on view, showing parties of children engaged in field work during rambles organised by the teachers on Saturday afternoons, or, in some cases, during the summer holidays. In these excursions the geological formation of the country is pointed out, and the flora and fauna of the district examined. In many cases photographs are taken either by the teachers or the scholars, and invariably careful records of the observations are made by the scholars in their notebooks.

Capital exhibits are sent from Lady Warwick's School at Bigod, Swanley College, and the agricultural schools of the Surrey and the Hampshire County Councils, illustrating the practical side of nature study as taught at these establishments.

The growing popularity of the subject is amply shown by the number and excellence of the training college exhibits. That from Salisbury is most comprehensive, completely illustrating the method in which this subject is taught, showing first the general scheme for the two years' course; next, a more detailed scheme of the first year's work, including blackboard drawing, clay modelling, and brushwork; and, lastly, one lecture, "The Fall of the Leaf," fully treated, showing the lecturer's notes and illustrations, also the students' notes of the lecture, collections of examples, blackboard drawings, clay models, etc. The rational method of teaching geography by commencing with the study of the district is well shown by the Home and Colonial exhibit, consisting of pictures, maps, and a relief model of the district of Highgate and Hampstead. Whitelands, Lincoln, Cambridge, and Southlands have also contributed useful and interesting exhibits.

But however interesting the models and collections may be, we must not overlook the fact that they are only means to an end, and that much good work is done without producing any more tangible result than a notebook. These are generally carefully avoided by the general public, but to the teacher they form the most instructive section of the exhibition. Here we find records of country rambles and nature study excursions, natural history calendars (showing that the children are taught, not when certain flowers, birds, etc., ought to appear, but to observe for themselves, and record their first appearance), notes on animal life, weather charts, maps of the district, etc.

Space will not permit us to quote largely from these notebooks; but the following account by a boy of his original experiments serves to show how a child's natural curiosity, when properly encouraged and directed, will lead it along the paths of true scientific investigation:—

"*January 12.*—Last summer I found that whichever way up a bean is planted, the radicle still turns down. To see if I could find out why, took two stoneware jam-pots. Half filled each with leaf mould. Then in each planted three beans, those in one having their micropyles pointing towards the top, those in the other towards the bottom, of the jar. Filled each up with leaf mould, pressed down tight, and tied a piece of gauze over each mouth to keep it in. Turned both jars upside down, and fixed them side by side in a tripod stand. Put the stand in a warm room, just in front of a south window, with a sloping mirror beneath to throw the light upon the gauze-covered mouths of the jars. Now, if the radicle turns down on account of gravity (either its own or water's), it ought still to turn down; but if it turns down by fleeing from the light and air, it ought now to grow upwards. Let us wait and see.

"*January 13.*—Turned the jars upside down for five minutes to water them.

"*January 15.*—Watered beans as on the 13th, only left them upside down for fifteen minutes, so that the water might soak well in.

"*January 18.*—Opened the stoneware jars containing the beans. All the radicles have begun to turn down, in spite of the light coming from below. But then I doubt if light would penetrate sodden grass mould, and the air would go through everywhere. They should have been planted in ordinary earth. What would the radicle do when it came to the gauze at the bottom?"

Of not less importance than the exhibition itself was the conference held in the museum, at which a number of valuable papers were read.

The Duke of Devonshire, in his opening speech, said:—"Perhaps my chief business to-day is to speak as to the manner in which this movement is regarded by the Board of Education. I need hardly tell you that it has our very warmest sympathy. It is frequently said, and I am afraid with a certain amount of truth, that education is not at present so fully appreciated in the rural districts as, I am happy to say, it has come to be in the great towns and urban districts. If there is any truth in this statement, the cause is that we have not succeeded in bringing education in the rural districts into the same relation with rural life and occupations as it has been brought in the case of the towns and urban districts. If the agricultural labourer does value education for his children at all, I am afraid it is too often with the object of enabling him to escape from the country, and from the drudgery of his own existence, into the more excited atmosphere of the town; and if that feeling has had any such effect upon the agricultural labourer, I do not think we can wonder very much if some of the country gentlemen

and many of the farmers have not hitherto viewed education and educational progress with any very great enthusiasm. We at the Board of Education have long felt conscious of the difficulty which we have too often encountered in the rural districts; and we have been most anxious to find some means by which education should be brought into closer relation with rural life and with the occupations connected with the cultivation of the land, and that all classes connected with the land should be induced to feel that education is a thing which is not necessarily antagonistic to, but which ought to be conducive to, the interests of all who are engaged in the cultivation of the land."

Mr. Hanbury said he wished to give some of the views of the Board of Agriculture on the matter. He represented an industry which perhaps more than any other depended to a considerable extent upon the experience and information which was to be derived from the study of nature; and unless the habit of observation was cultivated in early life, it was not easily gained whilst struggling against the difficulties of the farmer and the horticulturist. A good deal of the education given in country schools in the past had created a horror of education among the farmers owing to the immense amount of book learning which had been required; but he was sure that by making education more useful and practical than it had been, they would teach the farmers that education was as necessary for their industry as for any other, and the prejudice which existed would be removed.

Lord Avebury, in a delightful address, said that the most profound classical scholar, if he knew nothing of science, was but a half-educated man after all—a boy in a good elementary school had a better education. Animals, he thought, were perhaps more interesting objects of study than plants, but plants presented greater facilities for study. Almost all children are born with a love of natural history and of collecting. He would not underrate the pleasure and interest of collecting, but to him plants lost half their interest when they were gathered, and animals when they were killed. Many persons kept pets, but how few studied them. He had often been told that dogs were as intelligent as human beings; but when he asked if any dogs yet realised whether two and two made four, the answer was not confident. The whole question of the consciousness and intelligence of animals presented an interesting field of study. Then there was the life history of animals—scarcely one was fully known to us. Many problems were opened up by flowers, and leaves and seeds were almost equally interesting. There was a reason for everything in this world, and there must be some cause for the different forms of leaves. Some had been explained; but for the differences in the leaves of ferns, for instance, seaweeds, and many others, no satisfactory suggestion, so far as he knew, had yet been offered. The problems suggested by every field and wood, every common and hedgerow, every pond and stream, were endless and most interesting. In conclusion, Lord Avebury spoke of the moral benefits of the study of nature.

Lord Strathcona gave some interesting information concerning the state of education in Canada. "Education in Canada," he said, "rests with the provinces and not with the Federal Government; and the provinces have been doing a great deal with it, from the elementary schools up to the universities. The system is held to be not at all inferior to that of the mother country, and universities in Canada can take their place abreast of those in this country. In each of the provinces the government has model farms, and these have been of the greatest benefit to the farmers throughout the country. Even within the last three or four years nature study has brought about a great improvement, and young as well as old people are taking a greater interest in their work, because on their farms they were producing foods equal to those produced in England."

Professor C. Lloyd Morgan said that the value of nature study lay, not in imparting a particular kind of information, but in fostering an attitude of mind—an attitude of observational alertness, of inquiry into the meaning of familiar changes in garden, field, and hedgerow, of susceptibility to the subtle influences of nature. He was convinced that nature study must not only be regarded as a stepping-stone to science, but also as a means to literary and artistic culture.

Other interesting papers were read by Professor Bickmore (Natural History Museum, New York), Professor Miall, Professor Grenville Cole, Sir Joshua Fitch, and many others.

EDUCATIONAL RESULTS OF CHILD STUDY.

In treating the question of "What Child Study has done for Education," Principal William Scott, of the Toronto Normal School, gave the following summary of results before the Dominion Educational Association at Ottawa:—

1. Child study has freshened and heightened interest in children, and has inspired the teacher with a greater reverence for the little lives entrusted to her care.

2. It has shown that many so-called stupid children are suffering from growths in the nose or pharynx, causing them to hear imperfectly. These can be removed by a surgeon, and the child at once becomes normal.

3. It has shown that fine writing, small straight-hand drawing, the intricate work of some kindergartens, and the use of the fingers in carving in manual training with young children, are all contrary to the law written in their nerve centres.

4. It has shown that the strongest potential capacity in the child is that for action; that this capacity for action takes the direction of imitation; and hence every one who comes within the ken of the child becomes his teacher.

5. It has shown that each organ has its nascent period, and that neglect at any stage of development is always expensive; that periods of interest correspond to the nascent periods of the motor organs; that the time of interest is the time of opportunity, and that neglect of this opportunity results in irreparable damage.

6. It has supplied many useful lessons regarding fatigue: for example, mental fatigue is sooner induced where work is distasteful; the body wearies quicker when the mind is tired, and the mind more quickly when the body is tired; hence to secure the best results with the greatest economy of time and effort, pupils should work well when at work, and frequent periods of rest should be provided, etc.

7. It has demonstrated that formal physical exercise such as drill heightens rather than dispels mental fatigue.

8. It has shown that the time of physical growth is also the time of mental acquisition, and the old notion that rapidly growing children, if normal, should be removed from school, has been thoroughly disproved.

9. It has shown that the period of adolescence is of supreme importance; that youths are now vulnerable to all kinds of temptations; and that genuine sympathy is necessary at this time to assist the youth into full manhood or womanhood.

10. It has shown what can be taught to a child, and that children are much more interested in what an object can do and what it is good for than in its visible aspects.

11. Because some children are eye-minded, some ear-minded, and others motor-minded, it is impossible to teach all in the same way.

12. It has shown that it is impossible to teach morality by mere word of mouth, and has given the quietus to those who think that what is in the intellect must necessarily be in the heart, and find expression for itself in the conduct.

Dr. Karl Pearson, F.R.S., of University College, has been making a study of the physical measurements of Cambridge students and their careers, in order to find if there is any relation between mental ability and the size and shape of the head. All the subjects being of like nature and habits, there was less chance of mistake than had they belonged to different classes. The result of his study is that there is no marked correlation between ability and size or shape of the head, which is supported by the doctor's investigation on school children. His final conclusion is that very brilliant men "may possibly have a very slightly larger head than their fellows; but taking the general population, there is really a very insignificant association between size of head and ability."

In his recent report on the Training Colleges, Mr. Scott Coward again speaks in strong terms of the inability of existing colleges to meet the demand for certificated teachers, thus compelling during the past year, 2,500 women and 400 men to pass into the ranks "by the narrow and inefficient side-door of the acting-teachers' certificate." He recommends the utilisation of existing institutes similar to Hartley College, Southampton, and the Royal Albert College, Exeter, both of which have already been reorganised to meet the requirements of day-training colleges.

A COURSE OF OBJECT LESSONS FOR GIRLS' SCHOOLS.

BY WILLIAM DONE, B.A., HEAD-MASTER OF BRIGHTON PUPIL TEACHERS' SCHOOL.

XXIX. A BRICK.

Articles of Illustration.—Several new ordinary building bricks; weights and scales; basins of water; a lump of common clay; an iron spoon; spirit-lamp or gas; chalk-box with the bottom taken out.

Experiment and Illustration.	Result or Inference.
Arrange the girls in groups; provide each group with a brick and a ruler. Ask for the approximate length, breadth, and thickness of the brick, first by observation, then by careful measurement with the ruler.	Probably there will be much discrepancy in the answers as regards visual measurement of the brick, but the more the eye is trained the better will be the results. By means of the ruler it will be finally ascertained that our brick is about 8¾ inches long, 4¼ inches broad, and 2¼ inches thick.
In a similar way get the girls' notions of the weight of a brick by holding it in the hand. Weigh a brick in front of the class.	A brick weighs about 5 lbs.; and, again, we find that the muscular sense of weight is very deceptive in an untrained person.
Let the groups of girls stand their brick in a saucer or basin with a little water in the bottom.	The brick sucks up water; we can plainly see the wet creeping up the sides.
Weigh a brick which has stood with its end in water all night.	The brick now weighs almost 6 lbs. It must be very porous. We can understand damp rising up the walls of houses or coming through thin walls exposed to the rain. (When the girls go home show them the damp-proof course in the school walls, and let them see what it is and how it acts.)
Each group to have a piece of soft clay, and to mould a small brick with their hands.	The clay is soft, and can be kneaded or moulded like dough or putty.
The girls to mould little clay buckets or shallow pans, and to pour water into these objects. They could also stand the little clay model of a brick in water.	The clay is evidently not porous. We have, some of us, even noticed that clay is used to stop up the ends of water-pipes, etc., temporarily.
Collect the results obtained thus far.	Before clay is baked it is soft, easily moulded, not porous. After baking it is hard, brittle, porous.
Press some soft clay into the bowl of the iron spoon. Hold the spoon over the spirit-lamp.	As the clay gets hot it gives off steam. After a time it shrinks away from the spoon, falling off as we reverse the spoon, but keeping the moulded shape. It is becoming of the nature of a brick.
Take the chalk-box; with it mould a brick. Refer to any brickfields in the neighbourhood. What is done with the bricks after they are thus shaped in a mould?	Bricks are moulded from clay, so that they may be all one size. They are dried in the open air for some days, and then baked in a kiln.
Let the girls notice the arrangement of the bricks in the school walls. Collect the bricks in use in the class, and under the children's direction build a piece of a wall in front of the class.	The bricks are arranged for building in rows, showing alternately a side and an end. By this means, and with the mortar between, they bind better.
Notice the thickness of the walls of the schoolroom. Ask for recollections of thicknesses of walls at home.	Generally outside walls of houses are a brick and a half thick, while unimportant inside walls may only be half a brick thick.
Refer to the antiquity of brick-making, and again ask for recollections of what the girls have come across in their reading relating to this.	We read of the Israelites making bricks. We have remains of brick buildings left in our country by the Romans. The Israelites, however, and other Eastern nations only dried their bricks in the sun, consequently they were not so durable nor hard as our own bricks.

XXX. MORTAR.

Articles of Illustration.—A pennyworth of lime; some small saucers; a few handfuls of clean sand; the bricks used in the last lesson; some old knives, or anything similar, with which one could mix the ingredients of mortar; some fragments of old mortar picked out from walls.

Experiment and Illustration.	Result or Inference.
Arrange the girls in groups, as in last lesson. Provide each group with a small piece of quicklime, a saucer, some sand, some water, and a knife. Let the children examine the pieces of lime, and give the results of their own observation.	The pieces of lime are hard, like stone. The teacher had to break the lime with a hammer. The colour is grayish or yellowish-white.
Take a good-sized piece of quicklime and place it in a deep plate in front of the class. Pour water slowly on the lime. The girls may repeat the experiment in their groups.	The water disappears in the lime, but leaves the latter substance quite dry.
Let the class now look again at the teacher's former experiment, which by this time shows further results.	The large piece of hard lime is splitting into fragments; it is steaming, and gives out a slight hissing sound. The same thing is happening to the small pieces of lime on which water was poured by the girls themselves.
The girls may now place their hands underneath the saucers and test as to the temperature.	The saucers are quite hot, thus confirming the inference of the steaming of the lime.
By this time probably the lime will be quite broken down into powder.	Finally the hard, stone-like lime has become a soft, velvety powder, but still quite dry. (Give the names quicklime and slaked lime.) The quicklime unites with water until it has had sufficient, or is slaked.
Add more water until in excess.	Eventually the water is not absorbed as before, but the water and slaked lime form a paste.
Let the girls make a similar paste with their own portions of slaked lime.	The paste feels sticky, as if it would set if allowed to dry.
Mix with the slaked lime about four times as much sand; add more water as required. The girls will proceed in a like manner in the groups.	This is what we have noticed workmen doing when making mortar. The whole results, therefore, may be stated: quicklime becomes slaked lime when sufficient water is added; lime, water, and sand make mortar.
With the bricks from the last lesson build a small portion of a wall, showing how the mortar is used.	The bricks are slightly wetted, to cause the mortar to adhere better. There is a hollow in each brick to hold the mortar more conveniently.
Hand round the class some fragments of old mortar. Place also some mortar on one brick, to be set aside and examined in some days' time.	This mortar is quite hard—almost as hard as stone.

NOTES OF LESSONS.

BY F. J. FROST, B.A.,

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A LESSON ought to be a work of art, having a foundation in science in so far as there is a science of education. It should be a perfect, well-balanced whole, based upon psychological and logical principles. The average lesson falls short of this standard. Why? If you ask the average teacher to give reasons for adopting certain devices or methods of procedure in giving a lesson, he will be often at a loss to answer; or you will be told that so he had been taught, and experience had shown him that such and such methods produced the best results. In truth, you will find far too little consideration of education as a science; while young persons are thrown into the teaching profession, where they flounder about, either because they have no guiding principles, or because they are too young to understand and apply them. It is true that in spite of all this the system produces excellent teachers, capable of writing out and delivering a lesson in excellent style. These, however, are the exceptions, who may be disregarded for our present purpose.

The average teacher feels it necessary to prepare himself before delivering a lesson, and sometimes he sets out his lesson in note form. Any such teacher would probably, in thinking over the proposed lesson, debate the matter somewhat as follows:—I have to give this lesson to that class. I must find out how much they know about the subject. Having discovered, he continues: Now I must choose the subject-matter for the lesson and the best manner of presenting it, in order to get as much work from the class as possible. When I have told them all I have to tell, it will be necessary to recapitulate the whole lesson and test the knowledge of the class.

This, so far as my experience goes, is by no means an inadequate account of the sort of preparation which the average lesson gets. But again let me say, so much does the personality of the teacher tell, that even with materials comparatively so limited excellent results are sometimes secured.

Now I come to the discussion of what is the chief part of this paper—namely, the Herbartian system of teaching by the method of the five steps. This method can perhaps best be appreciated by comparison and contrast with the ordinary system already referred to. It is based on psychology and logic, upon the principles—

1. That the mind grasps new ideas by means of ideas already in the mind.

2. That all minds ultimately work in the same way in arriving at truth, so that there can be only *one method*, however many particular applications of the same may be attempted.

3. It is easier to teach two or more facts by association than single isolated facts.

4. "Percepts without concepts are blind." The mind must rise from particular ideas to general notions.

5. Knowledge which cannot be applied is not truly so called, and has been in some way ineffectually acquired.

6. True teaching will result in true interest, which is an eagerness to follow up the thoughts suggested by the teaching.

These principles may be, and often are, applied by teachers who know nothing of Herbart and his followers; but it is claimed that the system of teaching here advocated causes the teacher consciously at each point of the lesson to work for a definite psychological end. It is here that the five-steps method has such great advantages over the old unscientific method.

The following are the "steps," and, so far as possible, in a parallel column are indicated the corresponding steps of the ordinary system:—

THE FIVE STEPS.	CORRESPONDING PARTS OF OLD METHOD.
1. *Preparation* of the minds of the children by calling up into consciousness and arranging in order such ideas as they already possess which are akin to the new ideas to be presented in the next "step."	1. *Introduction.*—This is often far-fetched and inadequate. Too often it has little at all to do with the proposed lesson, especially psychologically.
2. *Presentation.*—The apperceiving ideas having now by *preparation* been made ready to act, the teacher "presents" the new ideas, which are to be seized upon and assimilated by the old, and so raised into clearness.	2. *The lesson proper*, which is practically what is called *Presentation* in the other column (but without the deep meaning that that has in its relation to the first step).
3. *Association* is best made, very often, during the preceding step (2). During *Presentation* a comparison or a contrast known to the class and suitable for the purpose occurs to the teacher. He immediately refers to it, and associates the idea or thought he is presenting with this other. By this means the associated elements are mutually made clearer and more sure.	3. Illustrations of all kinds correspond somewhat to association.
4. *Formulation.*—At this stage the central fact or facts of the lesson are focussed to a point. The teaching is summed up into a formula, or gathered up in a blackboard summary.	4. In a well-taught science lesson on the inductive method this stage is reached when the principle or law is enunciated by the pupils.
5. *Application.*—Now the pupils are set to apply the knowledge gained in the lesson.	5. Too often this is omitted; and when such is not the case the application is rather revision of the facts taught than an exercise of originality on the part of the scholars.

In conclusion, I will point out succinctly in what respects the newer method is preferable to the older. But first I should say that it would be a great mistake to follow this or any other system slavishly, and that to fully appreciate its value one must thoroughly grasp the system by using it.

The chief value of this method is the fact that you are consciously applying psychological principles. Your preparation and presentation are the practical application of the theory of apperception. By this system the work of the teacher is raised to a high level. He is engaged in completing the "circle of thought," in helping to a "many-sided interest," and, if he work in the spirit of the Herbartians, in calling out from each of his scholars the "good will," which was for Herbart the supreme aim of education.

In other respects the five-steps method is not very different from the ordinary method. You are, however, forced to think of associations—illustrations, contrasts, and comparisons. You are constantly reminded that the lesson should centre on and lead up to something quite definite; and when you have reached this point, you are reminded again that "knowledge is power" only when it can be properly utilised. The newly-learnt truths are to be at once applied—not merely recited as a test of memory.

As an illustration of this system of arranging notes of lessons, we shall give a short series of lessons on some famous pictures in the next few numbers of "The Practical Teacher." Copies of the pictures will be presented as supplements, so that teachers may use the actual notes drawn up as a means of familiarising themselves with the five-steps method.

The Practical
Infant-School Teacher.

SUBTRACTION TREATED AS COMPLEMENTARY ADDITION.

FOR INFANTS' SCHOOLS.

IT is obviously desirable that in certain branches of elementary teaching uniformity of method should exist. It is equally obvious that in such cases the method should be the best procurable. This paper is written with the hope that it may assist in producing the above results in the teaching of subtraction.

The average Britisher possesses an inherent tendency towards conservatism. It is in his blood, and consequently he looks askance at a new method; even when he consents to give it a trial, there is usually such a strong bias in favour of the old that the new does not receive full justice at his hands. In asking for a trial of the method indicated here, it is essential to point out, firstly, that it is educationally sound, and also effective in a considerable saving of time and labour; and secondly, that the trial must be carried out justly and completely—for example, it is better to try it with children who have nothing to unlearn rather than with those who have already acquired some knowledge of subtraction; and, again, it is unfair to compare its value after a month's work with that of a method that has been practised for twelve months. As with so much of the work done in an infants' school, its great advantage over other methods is only fully realised when the work of the senior departments is taken up; hence, for complete success, co-operation between the junior and senior schools is advisable.

First Stage.—It is assumed that children have learned to add, by means of sticks, beads, etc., simple numbers like 1 + 3, 2 + 2, 3 + 4, the total not to exceed 10.

Knowing that 3 + 2, 4 + 1 make 5, children will now be able to say how many beads must be added to 3 beads to make 5 beads, how many must be added to 2, to 4, to 1, in each case to make 5. They will also see that if one of their number has 5 beads and another 3 beads, the difference between them is 2, or the one has 2 less than the other, this being the number that must be added to the smaller number to make the larger. Dozens of examples, using concrete illustrations, may be taken in the above way in order to bring out the idea that the difference between two quantities is shown by finding what must be added to the smaller quantity to make the larger one. The ball frame answers admirably for this purpose. Taking 10 as the larger number, the complete number, exercises can be given, the answers to which are visually realised, until great facility is acquired in recognising how many must be added to 3, 4, 7, etc., to make 10, due care being taken to keep the idea mentioned above constantly in mind. This may be emphasised as follows:—Question, What must be added to 3 to make 5? Answer, 3 and 2 make 5 (with special stress on the 2). Question varied, What is the *difference* between 3 and 5? Answer, 2.

In this way addition and subtraction may be introduced in a most elementary form as related operations, and not two distinct rules, as is so often the case. The whole of these preliminary exercises would be oral and mental. If it is desired to express the results by means of written figures, it will be necessary to explain the usual conventional arrangement of placing one number under the other, and in the case of examples similar to the above, whether the sum or difference is required.

Second Stage.—Having become accustomed to the principle explained in first stage, mental exercises may now be taken, involving rather larger numbers—for example, 9 and 4? 13. How many must be added to 9 to make 13? to 4? What is the difference between 9 and 13? and so on, using throughout concrete examples, and keeping the main purpose in view. With this increase in the size of the numbers that can be dealt with mentally, there will be an increased knowledge of our notation, with ability to write easy numbers; and in this stage written exercises may be worked. All such exercises should be arranged to begin with so that each digit in the larger number is greater than the corresponding digit in the smaller one. For example—

(*a*)	(*b*)	(*c*)
85	47	59
32	16	27

In working, children say (*a*) $\bar{2}$ and 3 are 5; 3 and 5 are 8.
(*b*) 6 and $\bar{1}$ are 7; 1 and $\bar{3}$ are 4.
(*c*) 7 and $\bar{2}$ are 9; 2 and $\bar{3}$ are 5.

The figures underlined being emphasised and written for the answer.

Having obtained the answer to each of these, the two lower numbers in each case should be added to show that they are equal to the larger number.

Exercises should now follow in which the digits in the smaller number are not all necessarily less than the corresponding digits in the larger number. The following examples will show the method of dealing with such cases:—

(*a*) Take two numbers—for example, 612 and 309—add them together; the result is 921.

(*b*) Now, suppose it is required to find the difference between 921 and 612. Arranging the numbers in the usual way, we have—

612	921
309 (*a*)	612 (*b*)
921	309

and in (*b*) the question is to find what must be added to 612 to make the number 921. Nothing can be added to 2 to make 1, but 2 and 9 make 11, in which case 1 is put in the units' place and 1 ten is carried. Now this ten and the one in 612 make two tens, and 2 and $\bar{0}$ make the 2 tens in 921; lastly, 6 and $\bar{3}$ make 9, and the result is 309. If every step in (*b*) is taken with the corresponding step in (*a*) kept in mind, there will be no difficulty in realising the method of working.

These points should be noticed. In (*a*) the answer is the sum of two numbers, but each digit in the answer is not of necessity the sum of the two digits above it—for example, 9 and 2 make 11, of which only the 1 is written, the other 1 being carried. Similarly in (*b*), since 921 is the sum of 612 and some other number, the 1 in the units' place in 921 cannot be the whole sum of 2 and some other number, but only the units digit of that sum, which is the next number

above 2 having 1 for units digit—that is, 11. At this stage it is an advantage to take a little practice as follows:—

What is the next number above 7 having 2 for its units digit? above 9? above 13? above 25? and so on. This will simplify the working of questions in which addition and subtraction are combined. For example, what must be added to 57 + 39 + 48 + 164 to make 513?

Arrange as follows:—

513	
	Number required = 205
57	57
39	39
48 (*a*)	48 (*b*)
164	164
205	513

(*a*) is the conventional arrangement;
(*b*) is to make the method clearer.

513 is the sum of five numbers, four of which are known, the fifth one being required.

Adding the units of the four given numbers, we get 28. The units digit in the sum is 3; evidently this 3 is part of the number 33, the next number above 28 with 3 for its unit figure, so that the mental work becomes—

28 and 5 are 33;

the 5 being written as part of the number required.

The sum of the tens digits of the four numbers with the 3 carried from the 33 is 21, and as the tens digit in the sum 513 is also 1, we say—

21 and 0 are 21;

writing the 0 as part of our required number, and carrying the 2.

The last step is—

2 and 1 are 3 and 2 are 5;

the required number being 205.

In conclusion, it is necessary to repeat that the method will only be duly appreciated after a fair trial. Its value has been indicated above. In dealing with later rules, such as the Italian method of division, H.C.F., decimals, etc., this value is more clearly marked; while as an immediate gain, there is great economy of effort, and the abolition of any special device required by other methods, when taking a digit in the subtrahend from a smaller digit in the minuend.

ELEMENTS OF READING.

EXAMPLE LESSON V.—GIANT LETTERS.

BY C. M. A. COOMBS, L.L.A.

Apparatus.—A low table; the "Giant Letter Cards," which are stout cards about 10″ × 6″, upon each of which there is a letter both sides. The large ("Father") letters are red, the small ones ("Babies") blue. Each card needs two eyelet holes, through which is threaded a thick piece of knitting cotton, long enough to pass over a child's head.

Introduction.—Place the letters in a pile on table before class. Children sing (any simple tune):—

"Live little letters are we,
Happy as happy can be;
With work and with play,
We are busy all day,
Busy and bright as a bee."

Lesson.—Children, who want to be my little letters to-day? Well, let me see who can look hard at my
B table. Annie, you come and find me letter B. (Teacher should be careful that the child is so placed *behind* the table that the whole of the class can see what he or she is doing. Every child will be watching, being anxious to see if he finds or "passes" the right letter.) How do you know this is letter B? Yes, of course; it has two bumps. Say "B for Baby." Tell me what it says when it talks. (By this time the letter is found and hung round child's neck.) Who can tell
P me a letter with only one bump? Jack, come and find it then. What does it say to us? (Teacher call attention to the dull sound of B and the sharp sound of P.)

R, D, J, K, W, V, X, Z, Y.

Working after this manner, allow children to find all the above letters. (Very soon the work will be quite expeditious, so that a large number of letters may be chosen.) Array the chosen letters in a line in front of the class. Have each one named and sounded by class.

Games.—Let all the "live little letters" run away and hide: if not enough angles in the room, let faces and cards be hidden against the wall. Letter K is to be found. Let a child come out of the class and go and touch one little letter, who will then turn round and show his card. If it is the letter required, the finder takes hold of his hand and brings him to teacher. (This selecting of the letters is the chief educational value of the giant letters, which feature, it will be noticed, enters into all the exercises with these cards.)

When all the letters have been found, allow them to hold hands in a ring as well as the finders. Dancing round, they sing:—

"We are little letters all,
Running in a ring;
We must mind we do not fall,
Running in a ring."
(See "Giant Letters Pamphlet.")

Now one child in class selects a letter in the ring, calling out his letter name. He turns round, holding hands backwards. They all sing:—

"B must turn him round, and then,
Running in a ring,
We will play our game again,
Running in a ring."

When all the letters have turned round, all sing:—

"We have not quite finished yet,
We are called the alphabet.
Turn, quickly, turn."

Whereat all turn and face the centre again.

A second game is to allow one child from class to be postman. All sing:—

"See the postman, strong and tall,
Bringing letters for us all;
Rat-a-tat tat, he comes along—
I'd like to be a postman strong."

The corner of the room will make a good post office. Postman selects a letter, calls out its name (Z), takes it to Mr. Z in the class. He returns to the post office for second letter, and so on till all the letters are delivered. Children show great eagerness to be the postman.

Conclusion.—To end the lesson, teacher calls upon Mr. Z to bring back his letter. The children are delighted if the two are allowed to take hands and *dance* back.

During this process all can sing:—

"Dance, little letters, dance and sing,
While to teacher you shall bring
Round your neck that pretty thing.

"Good-bye, good-bye, dear letters red;
Now all our good-byes we have said,
Please put the letters back to bed."

This is the last example lesson. It will be noticed there is different apparatus for each day of the week, and that all the letters have been taken in the five lessons, showing that *all* the letters can be taught on these lines. It takes about three months to learn all the large letters and their sounds. If taught always in this play spirit, the baby teacher will find that letter learning is a distinct pleasure to these wee mites, while unconsciously they are sowing the seeds of observation and intelligence. The teacher will have the gratification also of knowing her babies are active, happy little beings, always eager and ready to come to school to talk to and play with teacher.

LITTLE JOHN BOTTLEJOHN.

Introduction.
KEY F.
C. t.
{| d :-.d :d |d :r :m | d :l1 :s1 |d :- :d | d :-.r :m |d :l1 :s1 | d :- :- |- :- :rs | s :-.fe :s | l :-.se :l | t :-.l :t |d1 :- :d1 }
Lit - tle John Bot-tle-john lived on the hill, A blithe lit - tle fel - low was he; He's stol - en the heart of a pret-ty mer-maid Who
f. F.
{| d1 :-.r1 :m1 |d1 :l :s | d1 :- :- |- :- :ds | f :-.f :f |f :s :f | m :-.m :m |m :f :m | r :-.r :r |r :m :r | s :- :- |- :- :s }
lived in the deep blue sea. She'd pad-dle a-shore, and she oft-en would sit, And she'd sing on the rocks by the sea,— "O

{| s :-.l :s | f :-.s :f | m :-.f :m | r :-.m :r | d :-.r :d | d :- :l, | d :-:- | l :-:- | s :-.f :m | m :- :r | d :-:- | l :-:- }
lit - tle John Bot-tle-john, pret - ty John Bot-tle-john, Won't you come out to me? Oh! won't you come out to me? Oh!
{| s :-.f :m | m :- :r | d :-:- | -:-:- ||
won't you come out to me?"
Interlude.

1 LITTLE John Bottlejohn lived on the hill,
A blithe little fellow was he;
He's stolen the heart of a pretty mermaid
Who lived in the deep blue sea.
She'd paddle ashore, and she often would sit,
And she'd sing on the rocks by the sea,—
"O little John Bottlejohn, pretty John Bottlejohn,
Won't you come out to me?
Oh, won't you come out to me?
Oh, won't you come out to me?"

2 Little John Bottlejohn heard her song,
And opened his funny wee door;
He hopped and he skipped, and he skipped and he hopped,
Until he came down to the shore:
And there on the rocks sat the pretty mermaid,
And still she was singing so free,—
"O little John Bottlejohn, pretty John Bottlejohn,
Won't you come out to me?
Oh, won't you come out to me?
Oh, won't you come out to me?"

3 Little John Bottlejohn made a low bow—
The mermaid she made one too;
She said, "Oh, I never saw any one half
So perfectly sweet as you.
In my lovely home beneath the sea foam
How happy we both might be.
O little John Bottlejohn, pretty John Bottlejohn,
Won't you come down with me?
Oh, won't you come down with me?
Oh, won't you come down with me?"

4 Little John Bottlejohn said, "Oh yes,
I'll willingly go with you;
And ne'er will I quail at the sight of your tail,
For maybe I'll grow one too."
He took her wee hand, and they swam from the land,
And dived in the foaming main,
And little John Bottlejohn, pretty John Bottlejohn,
Never was seen again.
No, never was seen again,
No, never was seen again.

Many graceful actions, such as paddling, holding out the hands as in pleading, making a bow, etc., should accompany this pretty song. A girl and a boy might *act* the parts of the mermaid and John Bottlejohn, while the others sing.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

SCHOLARSHIP EXAMINATION, 1902.

Ninth Month—September.

Work for the Month.

1. *Reading.*—*The Master of Ballantrae*, chaps. v. to viii.

2. *Repetition.*—This subject should now be completed. A word of caution is necessary to the student not to treat it as an insignificant part of the examination. Oral practice, with due attention to proper emphasis and modulation, and a thorough knowledge of the subject-matter, are very essential.

3. *Teaching.*—The teaching of history, chap. x., *Scholarship School Management.*

History is an important subject, especially to an English child. Bearing in mind that the end of education is not passing any prescribed examination, but the formation of character, it is obvious that a study of eminent characters in the past will have a great influence upon the susceptible mind of any child. There are few people who do not, unconsciously it may be, mould their thoughts and actions on those of some one whose biography they have read. The problems of life are never new—some one in the past has had to face the same difficulties we experience to-day—and if we have before us a solution of the difficulty, there is an irresistible tendency to follow the same line of conduct. Hence the teaching of biographies is a powerful agent for moral development, if handled properly. It is partly for this reason that biographical history is largely taught. Another reason is that the life of any great man presents a continuity and connection of facts which renders them easy to remember, and it is possible to make the life of a prominent man the centre of a series of lessons on the social, political, or economic history of the time. In connection with Alfred, for example, the greater part of Anglo-Saxon life, manners, and customs can easily be taught.

History as a school subject also develops the imagination and reasoning faculties. Every event is produced by some causes, and leaves some results. Take, for example, the dissolution of the monasteries. To merely tell a class that they were dissolved is to a great extent meaningless. What were they? when were they established? what did they do? why should they be dissolved? what were the results of the dissolution? are topics which require much elucidation to make the subject clear. The study of history is fascinating, if undertaken on the right lines; if not, it is a mere accumulation of dry facts and dates.

4. *Drawing.*—A freehand copy per week. Many students still set themselves altogether too low a standard in this subject. Fifty per cent. of the drawings sent in for criticism would obtain no marks at all, because they violate the most elementary principles of the art. The main curves of the copy are neglected; they are put in in pieces which do not fit. Nearly every copy is built up on some few bold curves—the spiral is the most common—and if these are properly drawn, the filling-in of the detail is a comparatively easy task.

There is nothing to be gained by doing the drawing in ink or with brush, unless it can be done *better* than with pencil.

As the result of the competition in this subject, the prize of half-a-guinea goes to George Calderbrook, Holker National School, Cark-in-Cartmel, Carnforth, with 18 marks out of 20. The next best drawings were those of Janet Miller, Banton Public School, N.B. (17), and P. M. Adams, 59 Park Street, Abergavenny (16).

5. *Music.*—Chap. ix., *School Music Teacher.* How to teach singing. Use of hand-signs. How to teach a school song, etc.

6. *Penmanship.*—Ten minutes' practice daily in *The Practical Teacher Copy Book*, and care at all times. This is usually a weak subject, owing to the lack of a little care and attention. Every one can write well if he likes.

7. *Spelling.*—One hundred words per week, from *Words Commonly Misspelt.*

8. *Composition.*—Write one or two essays each week, on such subjects as: (*a*) Your favourite pastime; (*b*) Your favourite author (with reasons for your choice); (*c*) The Lake Poets; (*d*) Gardens; (*e*) Envy; (*f*) "There is no crime in failure, but there is in not aiming high enough;" (*g*) The British occupation of Egypt; (*h*) The Glorious Revolution.

A skeleton plan must be prepared for each, and the subject studied before writing. Too many of the essays submitted to me are evidently written on the spur of the moment. There is no arrangement, much repetition of ideas, and little evidence of careful thought.

The prize offered in a previous number is awarded to Stanley Callaway, Bank House, Hatherley, Devon, who obtained 49 marks out of 50 for a remarkably good essay. Mary Greatorex, Carsington, Wirksworth, obtained 48; W. H. Edwards, City Road, Haverfordwest, 47; G. R. Chadwick, 21 Yew Tree Road, Walton, Liverpool, 46.

9. *English.*—

(1.) Twenty-five roots and meanings per week.

(2.) Figures of speech.

(3.) Chief nineteenth century writers.

(4.) *Julius Cæsar*, Act IV., Scene 3, line 160, to Act V., Scene 1, line 70.

Notes on "Julius Cæsar" (continued).

The quarrel scene between Brutus and Cassius is rightly considered one of the finest passages in Shakespeare's writings. The quarrel was perhaps inevitable. It was impossible that two men with such very different characters should always look upon matters with the same eye, especially when it came to the realities of life. One's sympathy is undoubtedly with Cassius. Brutus takes a very lofty moral view of matters. He unhesitatingly punishes an officer for receiving bribes, talks about money as "vile trash," which he admits he cannot raise, and is therefore under the necessity of appealing to Cassius. The latter had probably as much difficulty as Brutus, and to expect him to pay his own men, and also find the money for Brutus, was setting him a task which was impossible, unless means were used which, under ordinary circumstances, would be blameable. But when a party is fighting for its life, "right" gives way to "might," and as Cassius says—

> "In such a time as this it is not meet
> That every nice offence should bear his comment."

The whole scene is still further proof of what we have seen before—namely, Brutus was entirely out of place in political life: one cannot wage war in white kid gloves.

(1.) *Every nice offence should bear his comment.* *Nice* is used in the proper sense as small, trivial, particular. *His* = its. *His* is the correct form of the possessive case of *it*; *its* is a form which came into common use after Tudor times. Compare—"If the salt hath lost *his* savour," etc.

(2.) *The name of Cassius honours this corruption*—that is. The fact that Cassius supports this act prevents proper punishment being inflicted, but the offence is nevertheless quite as great.

(3.) *Did not great Julius bleed for justice' sake?* This, of course, is Brutus's view of the matter. He was too single-minded and unsuspicious to recognise even now that *justice* was the last thought in the minds of the other conspirators.

(4.) *You shall digest the venom of your spleen.* This, together with other references to *humour, blood ill-tempered*, etc., refers to the old belief that a man's temper depended upon the proportion in which certain fluids were mixed in his body (*temper* from Latin *tempero*, I mix). We still speak of people with "bilious," "splenetic," "jovial," etc., temperaments.

(5.) *If that thou best a Roman. That* is pleonastic in this case.

(6.) *Dishonour shall be humour*—We will consider any dishonourable act as being the result of a temporary derangement of your mind, and not as being done by you as the ordinary man.

(7.) *To bear* with me. An infinitive, limiting *enough.*

(8.) *This cynic rhyme.* An anachronism. *Rhyme* was unknown in Roman poetry.

(9.) *What should the wars do with these jigging fools?*—Why do silly, stupid fellows such as this mix themselves up in the serious affairs of civil wars?
(10.) *Of your philosophy you make no use*, etc.—Brutus, as a Stoic philosopher, should not let any outside circumstances disturb the calm serenity of his mind.
(11.) *Portia is dead.* Shakespeare's account varies in this case from history. Portia lived till after Brutus's death.

Figures of Speech.—The chief figures of speech are: simile, metaphor, allegory, fable, parable, personification, antithesis, irony, metonymy, synecdoche, hyperbole, apostrophe. A clear definition of each, with examples, should be entered in notebook and learned by heart.

10. *Geography.*—
(1.) Finish the revision of Africa.
(2.) West Indies and remaining American possessions.
The following questions on Africa may assist in the revision:—

(1.) What do you know of the productions, climate, government, and people of Madagascar?
(2.) Write what you know of the north coast of Africa and its principal harbours.
(3.) Account as fully as you can for the fertility of Egypt, and describe the position of Cairo, Port Said, Alexandria, and Khartoum.
(4.) Describe the chief lakes or inland seas of Africa, stating any circumstances which make any of them important.
(5.) Say what you can about the Gold Coast, Bechuanaland, Abyssinia.
(6.) Describe the course of the Congo, and say what you can of the Congo Free State.
(7.) Say what you know of the country between the head-waters of the Congo, Nile, and Zambesi.
(8.) Give some account of the races, climate, and productions of British East Africa.
(9.) Say what you can of the Cape to Cairo Railway.
(10.) A line of steamers runs regularly from Liverpool to the west coast of Africa. Mention the chief ports of call, and the principal articles which form the cargo on the outward and homeward voyages respectively.
(11.) Where and what are Griqualand West, Walfisch Bay, Buluwayo, Cape Coast Castle, Sierra Leone, Zanzibar, Khartoum, Kimberley, Massowah, Suakim, Teneriffe, Lagos, Blantyre, Lorenzo Marques, the Canary Isles, the Cameroons, Gondokoro, Ilala, Rosetta, Tangier, Tamatave, Boma, Comoro Islands, Magdala, Mafeking, Quilimane, Assouan, Benin, Perim, Socotra, Reunion, Fernando Po, Azores, Ascension, Tristan d'Acunha, Beira, Fez?
(12.) State what parts of Africa are under the rule or influence of Great Britain, France, Germany, and Portugal respectively. Give where you can the chief town, mountain, and river of each part.
(13.) What is meant by "the Soudan," "the Cameroons," "Somali Land," "Oil Rivers District," "Rhodesia"?
(14.) From what parts of Africa do we obtain gold, copper, aloes, ostrich-feathers, diamonds? Also in what parts do we find the tsetse-fly, gorilla, honeybird, zebra, and rhinoceros?
(15.) In the geography of Africa explain what is meant by the "ship of the desert," "the extinction of the slave-trade," "sphere of influence," "floods of the Nile," "the country of the mangrove."

The West Indies.—The chief points calling for special attention are:—
(1.) Productions:—Sugar, bananas, oranges, coffee, cocoa, cotton, pimento, nutmegs, indigo, tobacco, guava, ginger, aloes, sassafras, pine-apple, pomegranate, cocoa nut, oranges, lemons, limes, citron, mango, plantain, yams, sweet potatoes, mahogany cedar, lignum vitæ, iron-wood, maize, and rice.
Note causes of decline in sugar trade—abolition of slavery, introduction of beetroot sugar.
(2.) Races:—Negroes imported from Africa; coolies from India; "a mixture of peoples containing every shade from pure white to pure black." The native races, Caribs and Arrowauks, are now extinct.
(3.) Different governments:—
(*a*) Jamaica, with Turks and Caicos Islands (cap. Kingston).
(*b*) The Bahamas (cap. Nassau).
(*c*) The Leeward Islands, consisting of five presidencies, each having a local legislature—(1) Antigua (cap. St. John's), Barbuda, and Redonda; (2) St. Kitts (cap. Basseterre), Nevis (cap. Charlestown), and Anguilla; (3) Dominica (cap. Roseau); (4) Montserrat (cap. Plymouth); (5) The Virgin Islands (cap. Roadtown).
(*d*) Grenada (cap. St. George's), The Grenadines, St. Lucia (cap. Castries), St. Vincent (cap. Kingstown).
(*e*) Barbadoes (cap. Bridgetown).
(*f*) Trinidad (cap. Port of Spain) and Tobago (cap. Scarborough).

11. *History.*—George the First and George the Second.
Chief Points.—(1.) George the First's title to the throne.
(2.) The Rebellion of 1715, and the Riot Act and the Septennial Act.
(3.) The South Sea Bubble.—The South Sea Company was a company formed to trade with the Pacific and its coasts. To obtain a monopoly of the trade it offered to take over part of the National Debt, giving its own stock in exchange. The causes of failure were—(1) The Company was over-capitalised, and the directors promised impossibilities; (2) by the Treaty of Utrecht trade with Spanish America was limited. The springing up of mushroom companies and their exposure caused the bursting of the bubble. It must be remembered that there was a genuine opportunity for such trade as was proposed, but the whole affair was mismanaged.
(4.) Wood's Halfpence and the Drapier Letters.
George II.—(1.) Walpole's administration.
(2.) The War of the Austrian Succession.
Causes.—The Emperor of Germany, Charles VI., left his hereditary dominions to his daughter, Maria Theresa; and the other powers, by the Pragmatic Sanction, agreed to uphold her claim. Frederic seized Silesia; Bavaria, supported by France, claimed Austria; Spain, Poland, and Sardinia all demanded territory. England supported Maria Theresa against France, because the king feared for his Hanoverian dominions.
Events.—Frederic seized Silesia, then by treaty withdrew. George and Duke of Cumberland won Dettingen and lost Fontenoy. French influence brought about the Rebellion of 1745.
Results.—Peace of Aix-la-Chapelle: all conquests restored, but Frederic kept Silesia.
(3.) Reform of the Calendar.—The Julian Calendar, by taking the year as 365¼ days, and allowing one leap year in four, made each year about twelve minutes longer than it should be, hence the days were gradually falling behind the proper date—for example, Midsummer Day was eleven days behind the proper time as shown by the position of the sun. This was now rectified. Eleven days were omitted between September 2 and 14, and to prevent a mistake in the future, three leap years in every four hundred years were omitted—namely, from those centuries of which the first two figures are indivisible by 4: 1800, 1900, 2100, etc.
(4.) The Seven Years' War (of very great importance).
Causes:—(*a*) In India: The attempts of Dupleix to make France the dominant power, to the total exclusion of the English. (*b*) In America: The French endeavour to limit the English to the Atlantic coast by constructing a chain of forts up the Richelieu and down the Ohio and Mississippi to Louisiana. (*c*) In Europe: Maria Theresa had formed a coalition of all the Continental powers against Frederic, with the object of recovering Silesia. England supported Frederic, not because it agreed with his conduct, but because we were at war with the French and feared for Hanover.
Events:—Battles of Plassey and Wandewash secured our supremacy in India; battle of Quebec, etc., won Canada.

12. *Arithmetic.*—Square and cube root and their application.
13. *Algebra.*—Elementary surds. The method of fractionalising a fraction with a surd denominator and the solution of equations involving surds must be carefully studied.
14. *Euclid.*—Props. 35 to 48, Book I., with six deductions per week.
15. *Elementary Science.*—Apparent motions of the moon and sun, and their causes. Proofs that the earth rotates on its axis and revolves round the sun.
16. *General Information.*—Notes on the July paper:—
(1.) Most competitors located the quotation from *As You Like It.*

"All the world's a stage,
And all the men and women merely players:
They have their exits and their entrances;
And one man in his time plays many parts,
His acts being seven ages," etc.—Act ii. Sc. 7.

(2.) "No war or battle's sound
Was heard the world around,"

is from Milton's *Ode on the Nativity.*
(6.) The law of supply and demand was not explained fully. If there is a demand for any commodity, an attempt is made to supply it, and the price at which it is supplied depends upon the ratio of demand and supply. If the former is great and the latter small, the price will be high—for example, the demand for gold is far greater than the supply, hence the high price of gold. If the supply is equal to the demand, the price is low, and depends upon the cost of production. Air is in demand by all, and as the supply is inexhaustible it costs nothing. Water again is cheap because there is an adequate supply, but some charge is made to cover the cost of transit. An increased demand without a corresponding increase of supply means a rise in price.

Questions for Competition.

The answers to these questions are marked gratis. They should be sent *direct* to Mr. A. T. FLUX, The Bays, Belvedere, Kent, with a stamped addressed envelope for reply. *They must be accompanied by the coupon of the current number.* A prize of One Guinea is offered to the student scoring the highest percentage of marks.

1. Punctuate: "He said I think it was if not but or though."
2. What is sleep?
3. How can we prove that the earth is not exactly spherical?
4. Describe the circulation of the blood through the body.
5. How is it possible to foretell the weather?
6. Explain: Chinook, blizzard, harmattan, bise, typhoon.
7. To what do the following historical quotations allude:—
   (*a*) "Every man has his price."
   (*b*) "I know that I can serve the country, and that no one else can."
   (*c*) "Now they are ringing their bells; they will soon be wringing their hands."
   (*d*) "Roll up that map of Europe; it will not be wanted these ten years."
   (*e*) "Thy necessity is greater than mine."
   (*f*) "Put not your trust in princes."
8. What is caoutchouc, cinnamon, annato, spermaceti, amber, esparto, and ambergris? Whence are they obtained?

Test Questions on the Month's Work.

(The answers to these are marked and returned for a nominal fee of one shilling.)

1. *Penmanship.*
   Large Hand—*Whortleberry.*
   Small Hand—*The glories of our blood and state*
   Are shadows, not substantial things.
2. What use would you make of maps in teaching geography?
3. Write an essay on Reason and Instinct.
4. Analyse the following, and parse words in italics:—
   "*That* you have wronged me *doth* appear in this:
   You have condemned and noted Lucius Pella
   For taking bribes here of the Sardians;
   Wherein my letters, *praying* on his side,
   Because I knew the man, were slighted *off*."
5. Write a character of Octavius Cæsar.
6. Why is Africa called the "Dark Continent"?
7. Say what you can of Vancouver Island. Illustrate your answer with a sketch-map.
8. How far was Charles the Second's speech true when he said, "My words are my own, my acts are my ministers'"?
9. (1.) A cubic inch of wood weighs $5\frac{6}{7}$ drams. A piece measuring $4\frac{1}{16}$ in. by $2\frac{1}{2}$ in. by 1 in. was cut into matches 2 in. long and $\frac{1}{10}$ in. square. The waste and sawdust weighed $9\frac{1}{2}$ drams. How many matches were made? Ans. 360.

(2.) The map of a country is drawn on a scale of $\frac{1}{10}$ of an inch to a mile. What area on the map will represent 4,000 acres? Ans. $\frac{1}{4}$ sq. in.

(3.) A man invests £2,100 in the Russian 6 per cents. at $87\frac{1}{2}$, which he sells out at 85, and invests the proceeds in railway 6 per cent. debentures at $127\frac{1}{2}$. Find the change in his income. Ans. £48.

(4.) Find how much cardboard is required to make a cubical box and its cover. The edge of the box is 9 inches, and the rim of the cover extends 3 inches deep down each side. Ans. $4\frac{1}{2}$ sq. ft.

10. Prove that $a^0 = 1$ and $(a^m)^n = a^{mn}$.
Simplify—

(1.) $\sqrt[3]{ab^{-1}c^{-2}} \times (a^{-1}b^{-2}c^{-4})^{-\frac{1}{3}}$. Ans. $a^{\frac{1}{3}}$.

(2.) $\dfrac{x - 7x^{\frac{1}{2}}}{x - 5\sqrt{x} - 14} \div \left(1 + \dfrac{2}{\sqrt{x}}\right)^{-1}$. Ans. 1.

11. Explain the apparent daily and yearly motions of the fixed stars.
12. If a man is walking at the rate of 4 miles an hour, at what rate do his feet move (when moving)?

PUPIL TEACHERS' COURSE.

For Candidates' Examination, 1903.

1. *Reading.*—Oral practice before a competent critic is very necessary. The Department complains that pupil teachers do not read as they should. There is not sufficient attention to modulation and inflection of the voice, clear enunciation and pronunciation, due regard to stops, etc. Reading is generally too fast, and as a result the candidate does not take sufficient time to grasp the meaning, and without this there can be no intelligent reading.

2. *English.*—Ver. 13–16, Gray's *Elegy in a Country Churchyard.*

Ver. 13. "But they never had any opportunity to study the knowledge which had been accumulated by the research and wisdom of past generations; whatever nobler feelings they had were crushed out of existence by the sordid struggle for their daily bread, which occupied all their attention, and prevented the cultivation of wider and loftier ideas."

Rich with the spoils of time. Adjective phrase, qualifying *page.*

Nobler rage. Higher aspirations and enthusiasms. *Rage* is not used in the sense of anger.

Ver. 14. "In the same way, some of the most beautiful pearls lie hidden in the dark recesses of the ocean, and some of the sweetest flowers bloom and pass away without ever being admired by human eyes."

Full. Adverb, modifying *many.*

Many is a multiplicative adjective, limiting *a flower.*

Note.—"Many a flower" is different in meaning from "many flowers." In the former case, the meaning is one instance occurring on many separate occasions; in the latter, it may be many together at the same time.

To blush. Verb, infinitive mood of purpose.

Unseen. An adverb in this instance, modifying *to blush.*

Waste—that is, *to waste*, etc.

Ver. 15. "In this quiet churchyard may be laid one who withstood the injustice of a superior with as much bravery and self-denial as Hampden showed in his struggle against the king; some one who was filled with as noble thoughts as Milton, but who was unable to express them; some one who might have ruled as ably as Cromwell, but who never had the chance of causing the bloodshed of his countrymen."

Some. Demonstrative in this case. *Some* may express indefinite number, as "some apples;" or indefinite quantity, as "some bread."

Supply "here may rest" after Cromwell.

Ver. 16. "But their position in life precluded them from cultivating that eloquence which might have been received with the applause of the ablest in the land; their poverty prevented them from being indifferent to their future; and their humble state did not permit them to influence the fate of their country and to acquire fame by their services."

The four infinitive clauses in this verse—
(*a*) To command the applause of listening senates;
(*b*) To despise the threats of pain and ruin;
(*c*) To scatter plenty over a smiling land;
(*d*) To read their history in a nation's eyes,
form the object of *forbade* in the next verse.

3. *History.*—Edward the Third to Henry the Seventh, 1485.

The chief points are:—(1.) Edward the Third's war with France, Black Death, and Statute of Labourers. (2.) The Peasants' Revolt: its causes and results (very important). (3.) Henry the Fourth's claim to the throne. (4.) The plots against him. (5.) The Lollards and the Statute "De Heretico Comburendo." (6.) Henry the Fifth's campaign in France. (7.) The loss of the French provinces, and Joan of Arc, in Henry the Sixth's. (8.) The cause of the Wars of the Roses. (9.) The battles fought, and their results. (10.) Edward the Fourth as a king and trader. (11.) Battle of Bosworth, and end of the war.

4. *Geography.*—England: the midland and western counties. Draw maps, insert all names of places to be remembered. Enter details in notebook and learn by heart.

5. *Arithmetic.*—Vulgar fractions applied to concrete quantities. Problems in vulgar fractions.

In finding the value of the fraction of a concrete quantity—for example, $\frac{7}{17}$ of 5 tons 13 cwts. 2 qrs. 13 lbs.—it is *not* necessary to reduce the concrete quantity to a fractional form. Work it by multiplying it by 3 and dividing the result by 17. Candidates often give themselves much unnecessary work by turning everything into a fraction.

A very common type of problem is: "A boy spent $\frac{1}{3}$ of his money, then $\frac{1}{4}$ of the remainder, and then $\frac{1}{5}$ of the second remainder, and had 1s. left. How much had he at first?" Great care must be taken to state and explain the working fully; there is then little difficulty. For example—

(*a*) He spends $\frac{1}{3}$ of his money, therefore he has $\frac{2}{3}$ left.
(*b*) He spends $\frac{1}{4}$ of $\frac{2}{3}$ his money, therefore he has $\frac{3}{4}$ of $\frac{2}{3}$ left $= \frac{1}{2}$.
(*c*) He spends $\frac{1}{5}$ of $\frac{1}{2}$ his money, therefore he has $\frac{4}{5}$ of $\frac{1}{2}$ left $= \frac{2}{5}$.
Then $\frac{2}{5}$ of his money $= 1$s.
Therefore original amount $= 4$s.

A test paper on these problems will be set next month.

6. *Euclid.*—Props. 7–10, Book I.
7. *Algebra.*—Chap. vi., Hall and Knight: Division.
8. *Elementary Science.*—Change of rectilineal motion into circular. The lever.
9. *Music.*—Standard scale of pitch.

The pitch of a note is determined by the number of vibrations per second which produces it—the greater the number of vibrations, the higher the pitch, and *vice versâ*. In Tonic Sol-fa the standard note is *d*, and this is the sound produced by any string or reed vibrating 256 times per second. Upper *doh* (*d'*) is produced by 512 vibrations per second, and each of the other notes is produced by a fixed number of vibrations. In concert pitch *doh* is produced by 263 vibrations per second. French, German, etc., standards differ slightly from ours.

Test Questions.

1. Write as specimens of copy-writing:—
   (*a*) Large Hand—*Contradictory.*
   (*b*) Small Hand—*Slow rises worth by poverty depressed.*
2. Analyse the following, and parse words in italics:—

> "The *boast* of heraldry, the pomp of power,
> And *all that* beauty, all that wealth *e'er* gave,
> *Await alike* the inevitable *hour*—
> The paths of glory lead but to the grave."

3. Explain, with examples, "passive voice," "subjunctive mood."
4. Point out the importance of De Montfort's Parliament.
5. Who were the Lords Ordainers?
6. Describe as freely as you can the county of Devon. Illustrate your answer by a map.
7. Simplify—

(*a*) $\dfrac{2}{5 - \dfrac{5}{6 + \frac{1}{5}}}$. Ans. $\frac{11}{14}$.

(*b*) $\dfrac{2\frac{1}{3} \times 1\frac{2}{3}}{\frac{2}{3} \times 1\frac{2}{17}} \div \dfrac{1\frac{2}{3} \times 1\frac{1}{3}}{\frac{8}{13} \times 1\frac{6}{17}}$. Ans. 1.

(*c*) $\frac{4}{15}$ of $\frac{2}{3}\frac{2}{3} - 3\frac{1}{3} \div 13\frac{1}{3}$ of $1\frac{1}{19} + \frac{2}{7}$ of $\dfrac{6\frac{8}{19}}{1\frac{4}{7}}$. Ans. $3\frac{7}{20}$.

8. If a man is dragging a weight along the ground by means of a rope, is it advisable to have a long or a short rope? Draw diagrams.
9. Name the following intervals:—

$\{f\ t_1$ $\{r^1\ s$ $\{t\ m$ $\{f\ r$ $\{t\ f$

First and Second Years.

1. *Reading and Repetition.*—Daily practice needed. At least one of the short poems in *The Golden Treasury* should be learned each week.

2. *English: First Year.*—Cowper's *Task*, Book V., lines 122–160, or Cowper's *Expostulation*, lines 123–160.

Second Year.—Milton's *Paradise Lost*, Book III., lines 198–265, with twenty roots and meanings each week.

(Students are invited to write for assistance if needed. Full notes have been given in these columns. Instead of asking me to analyse and parse fifteen to twenty lines, I should prefer students doing it to the best of their ability, and then sending the work up for correction.)

Special Study.—(*a*) The noun. Classification and number. Prepare thoroughly from a good text-book. Note nouns that have no singular, no plural; that are plural in form though singular; nouns with two plurals, and the exact meaning of each.

(*b*) Palgrave's *Golden Treasury of Songs and Lyrics.*

Study Nos. 75, 79, 80, 85.

Notes.—(75.) *Thomas Dekker*, a dramatist who died about 1641. He is said to be the author of about twenty plays. He was a fellow-worker with Ben Jonson; but they quarrelled, and Jonson satirised Dekker in his *Poetaster*. The latter replied with another drama, *Satiro-mastix*, in which abuse was more prominent than wit or reason. Dekker's style is very uneven. Some passages are choice and elegant, others very commonplace.

(79.) This simple lyric embodies the manly, God-fearing faith which characterised many of the noted men of the period. It was the full trust in themselves, their integrity, their patriotism, and their God, which sent Drake round the world, or into Cadiz harbour; which enabled Sir Humphrey Gilbert to meet his death unmoved; and which animated Sir Richard Grenville when he fought his last great fight—"the one and the fifty-three"—and died in the full confidence of having done his duty to God and man.

(80.) *William Drummond* (1585–1649) of Hawthornden.

Another fine sonnet, with something of the same line of thought as the preceding.

(85.) *John Milton.* His life must be read up in a text-book, as we have not sufficient space to do justice to it here.

Read the author's note, page 353. The ode was one of the earliest of Milton's writings, and the whole of it is worth committing to memory. It is scholarly, most poetical, and full of the lofty ideas which particularly characterise the work of maturer years, *Paradise Lost* and *Paradise Regained.*

The poem will require very careful study.

3. *History: First Year.*—Edward the Second, Edward the Third, and Richard the Second.

Second Year.—George the First and George the Second. (For Notes, see Scholarship Course.)

The chief points are:—

Edward II.—(*a*) The Favourites; (*b*) The Lords Ordainers and their work; (*c*) The Battle of Bannockburn and final loss of Scotland.

Edward III.—(*a*) Legal reforms. (*b*) The Hundred Years' War. Note particularly that Edward's claim to the throne was *not* the cause of the war. The aid the French had given to the Scots, and the continual bickering of sailors, but more especially the revolt in Flanders, were the real causes. The Flemish towns were the buyers of English wool. They had revolted against the Count of Flanders. Unable to subdue them, he had appealed for aid to the king of France. If the latter had made his power supreme in Flanders, the English wool trade would have suffered severely. Hence the war. Edward's claim was weak and untenable, and only put forward to secure the allegiance of doubtful vassals of the north. (*c*) The Black Death and Statute of Labourers. (*d*) The misrule at the end of reign.

Richard II.—The chief interest of the reign lies in (*a*) The Peasants' Revolt; (*b*) The Lollards; (*c*) The king's misrule and deposition.

The Peasants' Revolt was the outcome of years of villenage. The upward striving of the masses, the demand for money rent instead of service, the demand for free markets, the revolts against the terms of the Statute of Labourers, the teaching of Wycliffe and the Lollards, the heavy and unjust taxation, were bound to produce such a movement. The results, though not immediately apparent, were the abolition of villenage and the emancipation of the labourer from the restraints of feudalism.

4. *Geography: First Year.*—Finish Europe.

Second Year.—The United States.

The United States will require very careful attention, especially productions, towns, and means of communication, and government—a federal republic.

The following questions have been asked:—

(1.) Name some of the great railways and waterways of the United States, and write a full account of one of them.
(2.) Give a brief description of the Yellowstone Park, explaining the cause of the peculiar phenomena to be observed. (This refers to the geysers, etc.).
(3.) Write what you know of the Gulf Stream.
(4.) Name four of the principal productions of the United States, and say what towns are specially interested in each product.
(5.) Which of the United States border the Gulf of Mexico? Say what you can of the climate and productions of one of them.
(6.) What rivers flow into the Gulf of Mexico? Describe the course of one of them.
(7.) Explain how the United States are governed.
(8.) Give an account of the rise and progress of San Francisco. What features would chiefly strike a stranger on his walking through the streets?
(9.) Describe the boundary between the United States and Canada, and illustrate your answer by a sketch-map.
(10.) Compare and contrast the Atlantic and Pacific States.
(11.) Where are the following, and for what noted?—The Colorado, Great Salt Lake, New Orleans, Milwaukee.
(12.) State the position and importance of Boston, New Orleans, St. Louis, Chicago, and Duluth.
(13.) From what parts of America are the following obtained:—Gold, silver, copper, lead, coal, iron, petroleum?
(14.) Give a brief account of either the agriculture, manufactures, mining industry, or fisheries of the United States.

5. *Arithmetic: First Year.*—Averages and Percentages, chaps. xxxv. and xxxvi., Christian and Collar.

Second Year.—Stocks.

The collection of examples in percentages and stocks in the text-book is very complete, and should be worked completely through.

6. *Euclid: First Year.*—19–24, with two deductions per week.

Second Year.—Book II., 1–4, with three deductions per week.

7. *Algebra: First Year.*—Chap. viii., Hall and Knight. Simple Equations.

Second Year.—Chap. xviii. Highest Common Factor.

The H.C.F. must be found wherever possible by splitting up the quantities into their factors.

8. *Elementary Science: First Year.*—Refraction of light; laws of refraction; index of refraction; total refraction, etc.

Second Year.—Chemistry of common salt, iron oxide, and mercuric oxide.

Test Questions.

FIRST YEAR.

1. Define, with examples from the poem you have studied, "co-ordinate sentence," "nominative absolute," "passive voice."

2. Point out the importance of De Montfort's Parliament.
3. What were Edward the First's chief legal reforms?
4. Describe the Alps. Illustrate your answer with a sketch-map.
5. Say what you can of the productions, imports, and exports of Italy.
6. (*a*) A and B undertake to do a piece of work for 21s. A can do it alone in 6 days, B in 7; with the help of a boy they finish it in 3 days. How much ought they to give the boy?
Ans. 1s. 6d.

(*b*) A, B, and C can together do a piece of work in 5 days. After working at it with B and C for 2 days, A leaves, and B and C finish it in 5 days. In what time could A do it alone?
Ans. 12½ days.

(*c*) A does half as much work again as B in the same time, and B does one-third as much again as C; working together they do a certain piece of work in 5 days. If, after working alone for 2 days, A leaves off, how long will B and C take to finish?
Ans. 7½ days.

(*d*) Of a piece of work 2 men and 5 boys can do half in 5 days, 3 men and 4 boys can do a third in 3 days. In how many days could 9 men do it?
Ans. 5 days.

7. Draw and explain the apparatus by which you would prove that when a mirror is rotated the reflected ray moves through twice the angle which the mirror moves.

SECOND YEAR.

1. What rules assist you in deciding whether a word is of Anglo-Saxon origin or not?
2. Point out any important constitutional principles which took their rise in the Revolution of 1688.
3. Why was the trial of Dr. Sacheverell important? Why was the Treaty of Utrecht considered unsatisfactory?
4. Say what you can of the waterways of Canada.
5. Point out what effect the opening of the Canadian Pacific Railway has had on the interior of Canada.
6. (*a*) By buying 3 per cent. consols at a certain price, I find I obtain 3½ for my money, and derive a net income therefrom, after paying an income-tax of 6d. in the £, of £421, 4s. 0d. Find amount and price of stock bought.
Ans. £14,400: 83⅓.

(*b*) Having invested equal sums in a 4 per cent. stock at 85 and a 5 per cent. stock at 95, I find that the difference in the income from the two investments amounts to £260. How much did I invest in each?
Ans. £46,655, 11s. 1⅓d.

(*c*) If 3 articles are sold for the cost price of 4, what is the rate of gain per cent.?
Ans. 33⅓.

7. If you were giving a lesson on carbon-dioxide to children, how would you prepare it, and what experiments would you work to show its properties?

CORRESPONDENCE: RULES.

To ensure an answer in the next issue, queries must be sent by the 15th of each month.

Name and address of sender, with coupon of current number of THE PRACTICAL TEACHER (and *nom de plume* if desired), must be enclosed.

As a rule, all replies will appear in the Correspondence Column; but any one desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to "Mr. A. T. FLUX, The Bays, Belvedere, Kent."

ANSWERS TO CORRESPONDENTS.

H.A.Y.—Penmanship, 12/20. Destitute of firmness and style. It is useless to rule guiding lines.

M.P. (Hoole).—Essay, 17/20. The chief fault is using stilted and unnatural phrases. Writing also requires attention.

C.G.B. (Clapham).—16/20. Thoughts good; expression stiff. Avoid rhetorical questions and exclamations. Nothing is gained by inverting the proper order of words in a sentence.

G. Rivers (Teddington).—Your essays were too late to be included in competition. The essay on "Liberty," 45/50; on "All the world's a stage," 46/50. Both good, but would be improved by judicious pruning.

A. E. Killick (St. Leonards).—Essay, 43/50. A good essay, which would have been stronger had the causes of expansion been examined.

J.L.C. (Long Melford).—Essay, 45/50.

Freehand.—Not large enough. You do not gain by inking in, unless you can do so better than you can with lead pencil. 13/20.

GENERAL INFORMATION FOR SCHOLARSHIP.

"Books, we know,
Are a substantial world, both pure and good;
Round these, with tendrils strong as flesh and blood,
Our pastime and our happiness will grow."—WORDSWORTH.

No General Information paper would be complete which failed to test the student's acquaintance with literature. It therefore behoves one to read as much as possible. With the whole range of literature before us, and a very limited amount of time at our disposal, it is most essential that our reading should be conducted on systematic lines, otherwise valuable time and effort will be wasted in desultory reading, which will produce very little result. The questions, then, which confront us at the outset are—(1) what books to read; (2) how to read them. Many excellent schemes of reading have been drawn up by different people, but it is almost impossible for one person to lay down hard and fast rules for the guidance of another in this matter, as so much depends on the individual; but it is most important that some rule or rules should be made, and, what is more important still, adhered to.

Emerson lays down the following rules:—

1. Never read books that are less than a year old.
2. Never read any but famous books.
3. Never read any books you do not like.

Of these three rules, the first two are excellent for the general reader, but the student should make an exception to the first in favour of works dealing with current events, and he must certainly disregard the third. Emerson himself says on this point that the book which fails to awaken the interest of the reader cannot be of any mental benefit to him; but the student should bear in mind that, if the book is a famous one, it must have interested thousands of readers, so, should he find such a book dull, this would indicate a weak spot in his mental training, and instead of throwing the book aside, he should endeavour to ascertain why he cannot appreciate a book which has afforded so much enjoyment to others.

This brings us to the second point—"how to read." The art of reading has been said to consist of reading in such a way that, with the utmost economy of time, one is able to secure the richest results. In order to do this one must acquire reading habits, which, like all other habits, can only be acquired by careful attention to some simple rules. At first, doubtless, this seems slow and irksome, but after a time the mind gradually adapts itself, and what was at first irksome is done without conscious effort.

The following rules, then, will be found useful for fixing and preserving the results of reading:—

1. Read thoughtfully, and reflect on your reading.
2. Make a short abstract of the book in your notebook.
3. Copy into your notebook any striking passage.
4. Never pass geographical, historical, or biographical references without making sure that you are acquainted with the point referred to.
5. If possible, criticise the books you have read, and discuss them with other people.

It is obviously impossible, in the short space at our disposal, to treat the subject of literature at any length, so we must content ourselves by indicating a short scheme of reading which, it must be understood, treats the subject from a "general information" point of view. Every student, however, should read *The Primer of English Literature*, by Stopford Brooke, or, if a larger work is required, Robertson's *History of English Literature* would be found a very useful and reliable book. Writers may be divided into five classes—(1) poets; (2) critics, essayists, etc.; (3) biographers and historians; (4) philosophers, etc.; (5) writers of fiction.

Poets and Poetry.—In dealing with this division of literature, it is necessary to repeat our warning that the student must disregard Emerson's rule, "Never read any books that you do not like." As far as our own experience goes, there are very few students who really like poetry; nor is this to be wondered at. Those who have read Macaulay's *Essay on Milton* will remember it is there stated that, "as civilisation advances, poetry almost necessarily declines," and the writer goes on to show that as the age becomes more enlightened, people are no longer affected by poetry to the same extent as the primitive races were. The best course for the student to pursue is to take some volume of selections from the poets and study this conscientiously. The *Golden Treasury* is well suited for this purpose, or *Thousand and One Gems of English Poetry*. Whilst reading, the notebook must always be at hand ready for entering the most striking passages,

and these should be committed to memory, as students are frequently asked to name the poem from which a given quotation is taken. Shakespeare is, of course, the writer most largely drawn on for quotations, but students must beware of the common error of ascribing everything to Shakespeare—there are other writers. Of all Shakespeare's plays, *Hamlet* is the one most quoted, and must therefore be carefully read by every student. A casual glance through it gives us such well-known lines as—

"Thus conscience does make cowards of us all."

"'Tis a consummation
Devoutly to be wished for."

"A countenance more
In sorrow than in anger."

"Frailty, thy name is woman."

"I must be cruel, only to be kind."

"Thus bad begins, but worse remains behind."

By the time the student has gone carefully through this play, he will be surprised at the number of familiar lines that he has met. Should he have time, *Julius Cæsar*, *Macbeth*, and *Romeo and Juliet* should be studied in the same way.

The following selection of quotations from our own notebook may be found useful. Frequently the same idea is expressed by two poets in almost identical words. Thus, in Gray's *Ode on a Favourite Cat*, we find the line, "Nor all that glistens, gold." This is, of course, a paraphrase of the line from the *Merchant of Venice*, "All that glitters is not gold." Again the warning, "Spare the rod and spoil the child," is commonly attributed to Solomon; whereas the line occurs in Butler's *Hudibras*, Solomon's words being, "He that spareth his rod hateth his son." We have endeavoured in all cases to give the original source of the quotation, but if in any case we have not been successful in tracing the idea to the fountain-head, we should be glad to be corrected.

"Hope springs eternal in the human breast."
POPE, *Essay on Man.*

"The proper study of mankind is man."—POPE, *Ibid.*

"Order is Heaven's first law."—POPE, *Ibid.*

"Damn with faint praise, assent with a leer,
And, without sneering, teach the rest to sneer;
Willing to wound, and yet afraid to strike,
Just hint a fault and hesitate dislike."
POPE, *Epistle to Arbuthnot.*

"A little knowledge is a dangerous thing."
POPE, *Essay on Criticism.*

"The feast of reason and the flow of soul."
POPE, *Satires.*

"Absence of occupation is not rest."—COWPER, *Retirem.*

"Slaves cannot breathe in England."—COWPER, *The Task.*

"God made the country, and man made the town."
COWPER, *Ibid.*

"England, with all thy faults I love thee still."
COWPER, *Ibid.*

"Heaven has no rage like love to hatred turned,
Nor hell a fury like a woman scorned."
CONGREVE, *Mourning Bride.*

"Music hath charms to soothe the savage breast."
CONGREVE, *Ibid.*

"None but the brave deserve the fair."
DRYDEN, *Alex. Feast.*

"Men are but children of a larger growth."
DRYDEN, *All for Love.*

"The child is father of the man."
WORDSWORTH, *Childhood.*

"A primrose by the river's brim,
A yellow primrose was to him;
And it was nothing more."—WORDSWORTH, *Peter Bell.*

"Peace hath her victories
No less renowned than war."—MILTON, *Sonnet.*

"Coming events cast their shadows before."
CAMPBELL, *Pl. of Hope.*

"He ne'er considered it as loth
To look a gift horse in the mouth."
BUTLER, *Hudibras.*

"He that complies against his will
Is of his own opinion still."—BUTLER, *Ibid.*

"Thick as autumnal leaves that strew the brooks
Of Vallombrosa."—MILTON, *Paradise Lost.*

"A sadder and a wiser man."—COLERIDGE, *Ancient Mariner.*

"When Greeks join'd Greeks, then was the tug of war."
LEE, *Alexander.*

"A thing of beauty is a joy for ever:
Its loveliness increases; it will never
Pass into nothingness."—KEATS, *Endymion.*

"How commentators each dark passage shun,
And hold their farthing candle to the sun."
YOUNG, *Love of Fame.*

"And all went merry as a marriage bell."
BYRON, *Childe Harold.*

"On with the dance! let joy be unconfined!"
BYRON, *Ibid.*

"I awoke one morning and found myself famous."
BYRON, *Ibid., Introduction.*

"Where ignorance is bliss
'Tis folly to be wise."—GRAY, *Ode on Eton College.*

"'Tis better to have loved and lost
Than never to have loved at all."
TENNYSON, *In Memoriam.*

"The pen is mightier than the sword."
LORD LYTTON, *Richelieu.*

"Procrastination is the thief of time."
YOUNG, *Night Thoughts.*

"Tired nature's sweet restorer, balmy sleep!"
YOUNG, *Ibid.*

"Go where glory waits thee."—THOMAS MOORE.

"More things are wrought by prayer
Than this world dreams of."—TENNYSON, *Morte d'Arthur.*

"Fame is the spur that the clear spirit doth raise
(That last infirmity of noble minds)
To scorn delights and live laborious days."
MILTON, *Lycidas.*

"One touch of nature makes the whole world kin."
SHAKESPEARE, *Troilus and Cressida.*

"This weak piping time of peace."
SHAKESPEARE, *Richard III.*

"I am a man,
More sinned against than sinning."
SHAKESPEARE, *King Lear.*

"A snapper up of unconsidered trifles."
SHAKESPEARE, *Winter's Tale.*

"'Tis not in mortals to command success;
But we'll do more, Sempronius—we'll deserve it."
ADDISON, *Cato.*

OUR CERTIFICATE COURSE FOR 1903.

BY GEORGE COLLAR, B.A., B.SC.,
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TEST QUESTIONS ON LAST MONTH'S WORK.

THEORY OF TEACHING.

1. Grammar has been sometimes defined as the "art of speaking and writing the English language with propriety." How far does this definition appear to you to be true or adequate? By what expedients, other than the teaching of technical grammar, is it possible to enrich a scholar's store of words, and to encourage precision in the use of them? (Certificate, 1892.)

2. What bad mental habits are liable to result from the exclusive study of (1) languages, and (2) physical science, respectively? (Certificate, 1894.)

3. In teaching English, would you prefer to begin with the "parts of speech," or with the complete simple sentences? Give reasons for your choice, and show how you would proceed with the method which you prefer. (Certificate, 1894.)

ENGLISH GRAMMAR AND LITERATURE.

1. Give a summary of the changes which have taken place in the course of the development of modern English from Anglo-Saxon.

2. Explain the following phrases:—*Wear her livery; were best he do it secretly; cheated of feature by dissembling nature; these windows that let forth thy life; when black-faced Clifford shook his sword at him.*

ENGLISH HISTORY.

1. Compare the possessions of Henry the Second with those of William the Conqueror, and say how the increase was brought about.

2. In what ways were the continental possessions of the Nor-

man and Plantagenet kings an advantage or a disadvantage to this country?

3. Give a short account of the chroniclers of the twelfth and thirteenth centuries.

GEOGRAPHY.

1. Give an account of the industries of Holland and of Belgium.

2. Describe the physical features of Holland and of Belgium.

ARITHMETIC.

1. Define a "multiple," a "common multiple," and the "least common multiple." State the rule for finding the L.C.M. of five given numbers, and prove that the number thus obtained is the least common multiple.

2. Prove that if n is a prime number greater than three, the expression $n^2 - 1$ is divisible by 24.

EUCLID.

1. Show how from a given point to draw a straight line equal to a given straight line. Write out the various postulates and definitions used in your proof. (Certificate, 1901.)

2. Show how to describe a triangle having its sides equal to three given straight lines, any two of which are together greater than the third.

Given five lines of lengths 15, 12, 10, 8, 3 inches, show how many different triangles may be drawn, each to consist of three of the lines. (Certificate, 1901.)

ELEMENTARY SCIENCE.

1. Give examples of bodies which are valuable, respectively, on account of their *rigidity*, *plasticity*, and *elasticity*.

2. How could you show that the following are elastic—air, glass, steel? If you had some pieces of wire, all of the same length and thickness but of different metals, how could you decide which was the most elastic?

SYLLABUS AND NOTES FOR SEPTEMBER.

ENGLISH COMPOSITION.

Write essays on the following subjects:—

1. "History repeats itself."
2. Charity.
3. The use and abuse of novel reading.

SCHOOL MANAGEMENT.

Study the methods of teaching composition and poetry. Those who have a copy of Kingsley's *Essays* within reach should carefully read the essay on English composition. He calls style and language the "sacraments of thoughts, the outward and visible signs of the inward and spiritual grace, or want of grace, in the writer." The first essential of expression is that there should be something to express—something to "press out;" but yet too often children are set to "do a composition exercise" on a topic on which they have never thought, and older students often attempt to write an essay on a subject of which they are practically ignorant. It may, of course, be urged that the supply of *material* for thought does not come within the scope of the composition. It would be more true to say that, in every lesson in which the children are led to think clearly of some subject, the teacher is improving their power of composition. The next point is to connect the composition lesson with the grammar lesson. Children must never be allowed to think that the sole purpose of learning analysis of sentences is to be able to fill up certain rectangles on examination days. Every lesson in analysis should have its practical outcome in composition. Thus the first step—the division of the sentence into subject and predicate—should show the children that whenever they write a sentence they must employ certain words to denote what they are thinking about, and certain others to show what they think of it. So when they are taught that noun-sentences and noun-phrases may be substituted for nouns, they must be taught to change one for the other, and then taught to appreciate the difference in suitability. The faults usually met with should be tabulated by the teacher for his own use; but it is quite a mistake to give children incorrect sentences to correct, and state their reasons. In the first place, this familiarises them with forms and expressions with which they should have nothing to do, and very commonly their explanations are pure guesswork; for many children who can correct a wrong expression will just as readily spoil a correct one, and their knowledge of the nice points of formal grammar is not deep enough to serve as a criterion.

Particular attention is called to pages 165–168, on the teaching of poetry, and it is hoped that the remarks there made will help our readers not only in teaching poetry to their children, but also in the study of the *Golden Treasury of Songs and Lyrics* set for their own work.

ENGLISH HISTORY.

This month a thorough study of the Crusades and of the rise and development of parliamentary institutions should be made. The history of the Crusades is a very fascinating one, and many books have been written on the subject. Perhaps as faithful an account as any that has yet been written is that contained in chapters lviii.–lxi. of Gibbon's *Decline and Fall of the Roman Empire*; and as this book is found in nearly all public libraries, our readers should consult it. Those who are well on with their French should read Michaud's *Histoire des Croisades*. We will give a summary of the events connected with each.

First Crusade, in the time of William Rufus, preached by Peter the Hermit: Jerusalem captured, 1099, and a Christian kingdom founded.

Second Crusade, preached by St. Bernard in 1144, commanded by the Emperor Conrad and Louis the Seventh of France: the Christians were completely defeated at Tiberias, 1187.

Third Crusade, under the Emperor Frederick Barbarossa, Philip Augustus of France, and Richard Cœur de Lion, against the greatest champion of Mohammedanism, Saladin the Great. Frederick began by marching his forces overland; but he was accidentally drowned in the river Cydnus in Asia Minor, and most of his knights returned to their homes. The journey of the French and English forces by sea, and their actions on land, as well as the misfortunes of Richard on his way home, are well known.

Fourth Crusade.—This was organised by Pope Innocent the Third; but instead of making war against the Saracens, it was directed against the Christian kings of Hungary, and then to a fiercer and more calamitous warfare upon the Christian Emperor of the East. Zara was conquered for the benefit of the Venetians, and Constantinople was twice besieged by them; and this great Christian city was treated with more cruelty by the Crusaders than it was later on by the Turks, who captured it in 1453.

Fifth Crusade, undertaken by Frederick the Second, the grandson of Frederick Barbarossa, but without the direction of the Pope. Some places were restored, but there were few military achievements. It was ill supported, owing mainly to the falling off of enthusiasm, and to the organisation of crusades in the West against the pagans of Livonia, the Moors of Spain, and against the Christian sect called Albigeois in France, and the Christian king, Mainfroy of Sicily. As the Pope promised full remission of sins to those who took part in these latter crusades, there was no inducement to go farther east to merit the same reward.

Sixth Crusade.—This was undertaken by Louis the Ninth of France (St. Louis). He was defeated and taken prisoner in Egypt; and when fighting against the Moors in the north of Africa, his army suffered terribly from heat and sickness, and he died near the ruins of Carthage. His son and successor then ordered a retreat. This crusade proved a terrible strain on the resources of France.

Seventh Crusade.—This was just a military expedition under Prince Edward, afterwards Edward the First of England. He delivered Acre from a siege, and marched as far as Nazareth. He obliged the Saracens to agree to a ten years' truce, and narrowly escaped assassination.

Effects of the Crusades.—As regards the attempt to establish a Christian kingdom in Palestine, the Crusades must be regarded as a failure, and we cannot help regretting the enormous waste of blood and treasure to which they gave rise. If the thousands of men who laid down their lives in the East had been suitably employed at home, their native countries would have been vastly improved, and the treasure wasted might have been profitably employed in peaceful commerce. Students frequently make the mistake of supposing that the Saracens were barbarians or half-savages; but the fact is, their civilisation was far superior to that of Western Europe. Hence the Western nations gained by the contact. The introduction of many comforts and luxuries has been recorded, and no doubt we owe many more things to Eastern civilisation than have been accounted for by the historians. Silk and sugar were both introduced from the East, and such an invention as the windmill owes its origin to the dry country of Asia Minor, whence they were first introduced into Normandy in 1105. The intellectual spoils of the East were not at first seized on directly; and when Aristotle's philosophy was introduced to the West, it was not through the Greeks themselves, but through the debased Arabic translations

of the Moors in Spain. Socially, a great benefit arose, for there was a tendency towards a gross political preponderance of the clergy and nobles. But in their anxiety to go east, many of the nobles were glad to raise funds by the enfranchisement of their serfs, and by granting charters of freedom to the towns on their estates. Their power was diminished by the dissipation of their estates, and frequently their race was extinguished in these sanguinary conflicts.

In preparing the reign of John, notice how the events centre round three quarrels—(*a*) the quarrel with Philip Augustus, about the claims of Arthur; (*b*) the quarrel with the Pope, about the election of Stephen Langton; and (*c*) the quarrel with the barons, resulting in the grant of Magna Charta. We have become so accustomed to hereditary succession that we look upon John as a usurper, forgetting how very irregular the accession had been since the death of Edward the Confessor. The point which had most weight in the acceptance of John was the statement made by Archbishop Hubert at the coronation in Westminster Abbey, that John had been elected at Northampton by the Great Council. As a result of the war, the English crown lost by the year 1204 Anjou, Maine, nearly all Touraine, Brittany, and even Normandy, which had been in the hands of the family of Rollo for four centuries. Really a great national benefit sprang from the loss of these continental domains, for a new patriotism arose. So long as large numbers of the nobility had estates and homes in Normandy, they could never become English; for as they affected to despise the English, they had no desire to become one nation with them. But when they lost their continental estates, they felt the necessity of throwing in their lot with the English, and before the end of the reign of John we find them combining with the freemen of England to resist the tyranny of John.

John's quarrel with the Pope has already been dealt with.

In the exaction of Magna Charta from John, the part played by Stephen Langton is often overlooked. Although Langton owed his appointment to Papal intervention, he refused to obey the orders of the Pope, brought by Pandulph, that he should excommunicate the barons unless they submitted to the king's will. Langton coldly replied that he knew the Pope's real mind better than Pandulph did, and that instead of excommunicating the barons, he should excommunicate John's foreign mercenaries unless the king instantly dismissed them. In the autumn of 1213 Langton produced the charter of Henry the First at a great meeting of nobles and prelates, and told them to force John to re-establish the charter, and so gain their just rights. All present took an oath to obtain the reissue of that charter, and to strive, even to the death, for their liberties. On St. Edward's Day, 1214, they renewed this oath in the church of St. Edmund's Bury, and on the Feast of the Epiphany they laid their demands before the king in London. John was troubled, and promised to give an answer by Easter. Meanwhile he tried to induce the clergy to abandon the barons, by granting a charter to the church, and asked the help of the Pope; but in vain. On May 25, the army of the barons entered the metropolis, and the citizens, led by the mayor, eagerly welcomed them, and John was obliged to appoint a time and place of meeting. After a long conference at Runnymede the charter was drawn up and sealed—not *signed;* there is no signature on any extant copy, and there is no reason to believe that it ever was *signed*.

Geography.

Study the geography of Spain and Portugal, and of Italy.

Pay close attention to the mountains and rivers. In Spain and Portugal the rivers generally run in deep channels through table-lands; hence they are of little use for irrigation, and difficult to connect by canals. They are commonly impeded by shoals and sand-banks, so that navigation is difficult; and during the summer months they have very little water in them. The Guadalquivir is the most useful for navigation.

The climate is warm, and the summer dry. The total rainfall for the year is under twenty inches in most parts. Portugal has a much moister climate than the rest of the peninsula. Spain has great mineral wealth, and some parts are very fertile, but it is neither a commercial nor an industrial country. This is mainly owing to religious intolerance, and to the loss of the more vigorous inhabitants by emigration to South America. The young king occupies a very difficult position; for not only are there strong antagonistic political parties—Carlists, Socialists, Republicans—scattered throughout the country, but Catalonia, the most prosperous province, is anxious to become a separate state.

The student will find a very interesting account of *Spain* and of *The Moors in Spain* in the "Story of the Nations" series.

Practise the map of Italy. The country is best studied in two sections—(*a*) the continental part; (*b*) the peninsular portion. These differ rather widely from one another. Continental Italy is a wide, fertile plain, bounded on the west and north by the Alps, and watered by the Po and its tributaries.

This plain is known as the Great Plain of Lombardy, which is both the great agricultural and manufacturing part of Italy. Cereals, rice, olive-oil, poultry, eggs, and cheese are important products, and the silks and velvets of Turin and Genoa rival those of France.

In this plain we find some of the wealthiest and most prosperous cities of Italy—Milan, Bologna, Turin, and Verona. It also contains many strongly fortified places, and has been the scene of many battles.

Genoa is still an important port, but the trade of Venice is almost a thing of the past.

The mountain passes—St. Bernard, Simplon, Maloja—were formerly important as means of communication with countries to the north; but their importance has been taken away by the cutting of railway tunnels, particularly at Mt. Cenis and Mt. St. Gothard. Another tunnel is now in course of construction at the Simplon.

English Language and Literature.

Study the periods at which words of Latin origin have been introduced. The distinction between words introduced directly from Latin and those that came through the French is pointed out by Nesfield, and should be noted; but it is impossible for students who are not well up in Latin and French to work satisfactorily at this subject.

Prepare in detail *Richard the Third*, Act I., Scenes iii., iv.

Scene iii., line 36. *Atonement*, reconciliation; a setting *at one:* this is the true meaning of atonement. (See Acts vii. 26.) The word is hybrid, being formed from the A.S. *at one*, and the Latin suffix *-ment*.

46. *Dissentious*, strife-making; causing dissent or discord.

53. *Insinuating Jacks*. Although we often apply the name Jack to our sailors, and hence the word implies a sort of openness, yet formerly it was a term of contempt. Compare Jack-ass, Jack-daw, and the old phrase Jack-pudding, Jack of all trades. See lines 72, 73.

61. *Lewd*. This word now means immoral or indecent; but formerly it meant ignorant or untaught, and was used in opposition to "learned."

82. *Worth a noble*. A noble was a coin worth 6s. 8d. Notice the grammatical construction. *Worth* is an adjective qualifying "that," while "a noble" is an adverbial object limiting "worth."

83. *Careful height*, this exalted position full of care.

90. We should now omit the negative after deny: "You may deny that you were the cause."

99. *Marry* in this line is an oath, meaning by the Virgin Mary. In line 100 the same word means "to wed;" hence the pun.

102. *I wis*. This should be written as one word, *iwis* or *ywis*. It is the later form of *gewis*, the A.S. adverb "certainly." Be careful not to assume that *wis* is a verb; parse the two as an adverb, modifying "had."

Your grandam, Joan Beauchamp, mother of Richard Woodville. It is a scoffing remark at her origin.

Worser. This is a double comparative. The A.S. comparative "wyrsa" gives *worse*, in which the comparative ending *-se* remains, and does not change into *-er* or *-re*. To this *-er* has needlessly been added.

109. *Baited at*. To bait is from the same root as *bite*. Compare *bait stable*, in which horses may have "a bite" of food. A favourite sport in the middle ages was "bull-baiting," in which dogs were set on to *bite* a bull.

112. Thy honour, state, and seat *is* due to me. We can only justify the use of the singular by regarding the three nouns as synonyms. If we regard them as denoting only one thing, then the verb ought naturally to be in the singular. Compare:—

> "Bitter *constraint* and sad *occasion* dear
> *Compels* me to disturb your season due."
>
> Milton's *Lycidas*.

135. *His father*, really his father-in-law, Warwick. The student must carefully revise his history of this period if he wants to fully understand this play.

144. *Cacodemon*. In Greek the word *demon* meant either a good spirit or an evil spirit, a genius. *Cacodemon* has the prefix *caco-* (Greek *kakos*, bad) to show which is meant. In modern English the word denotes a bad spirit.

159. *Pilled* = pillaged, from Fr. *piller*, to plunder.

164. *What makest thou?* = What are you doing? But in the next two lines Margaret uses the word literally, and says she will make a recital of the wrongs done by Richard, thus using the common antithesis between making and marring.

177. *A clout steeped*, a cloth soaked.

The student should go in detail through the curses uttered by Margaret, and note how each was fulfilled. We must not suppose that Margaret did actually utter these curses, but it was very easy for Shakespeare to put these prophecies into her mouth after the events had happened. It should be noticed that not only Shakespeare, but his contemporaries in general, spoke in favour of the Lancastrians, and regarded the Yorkists as usurpers, and this was no doubt due to the fact that the Tudors regarded themselves as Lancastrians.

256. *Fire-new.* We generally say "brand-new." Both words have the same meaning—newly cast, like a new coin which has hardly been in circulation.

265. *Aery.* The nest of an eagle is called an *aery;* also spelt *aerie, eyrie,* and *eyry.* Some derive the word from Early English *ey,* an egg; hence an "eggery," or place where eggs are laid. Others derive it from Lat. *area,* a stretch of level ground. The name got transferred to the brood of the royal bird, and hence in this line is used to denote the royal family.

296. *Nothing that I respect*, nothing that I attach importance to.

313. *Franked up to fatting*, imprisoned. The figure is drawn from the practice of putting cattle and poultry in small pens, so as to deprive them of exercise and make them grow fat.

317. *Scathe*, injury. The word is now obsolete, but we have the adjective *unscathed.*

325. *Abroach.* The verb *broach* is allied to *break.* To broach a cask, or set it abroach, is to make a hole in it, so as to let the liquor run out.

345. *Crosby Place*, in Bishopsgate Street, London, now called Crosby Hall. It was built by Sir John Crosby in 1466. Richard of Gloucester lived there, and it has since been used as a palace, a prison, a Presbyterian chapel, a warehouse, a concert hall, and is now a restaurant. It is one of the few remains in London of Gothic domestic architecture of the fifteenth century.

Scene iv. This scene, omitting the dialogue between the murderers (lines 98–160) is very suitable for recitation.

13. *Hatches.* Here it means the deck. Literally the hatches are the parts that cover the openings (hatchways) in the deck.

27. *Unvalued*, invaluable. Notice the force of the prefix. It does not make a direct negative from the word to which it is added.

45. *Melancholy flood*, the river Styx, across which the souls of the departed were supposed by the ancients to be ferried by "that grim ferryman" Charon.

83. *There's nothing differs.* Here we have a redundant finite verb. It should be either "nothing differs," or "there's nothing *that* differs."

240. *Ay, millstones.* Yes, (he will weep) millstones, as he instructed us to do. See Scene iii., line 354.

242. *Snow in harvest.* See the first verse of the twenty-sixth chapter of Proverbs.

284. *This will out*, this will become known; this will leak out.

Arithmetic.

Go to the end of vulgar fractions, and pay close attention to the theory, and to illustrations used in teaching. Be sure that you can prove the theorems on which cancelling and multiplication and division are based. Division is very apt to degenerate into a mechanical trick unless the *proof* of the rule is frequently revised. The principle that the value of a fraction is not altered by dividing both numerator and denominator by the same number is often used in simplification of fractions; but the corresponding fact that the numerator and denominator may be multiplied by the same number is often lost sight of. This leads to some clumsy methods of work. Suppose we have to simplify $\frac{\frac{3}{4}-\frac{3}{8}}{\frac{3}{4}+\frac{5}{12}}$. The best way to work is to multiply the numerator and denominator of this complex fraction by 24, the L.C.M. of all the denominators. This gives $\frac{20-9}{16+10}=\frac{11}{26}$. In any case of simplification the fraction must be treated as a whole, and not worked out in scraps.

Algebra.

Go to the end of simultaneous equations.

Euclid.

Finish the revision of Book I.

General Elementary Science.

Composition of Matter.—The old alchemists held that all matter consisted of four elements—earth, air, fire, and water. When they affected a substance by heating it, they believed that they had made it combine with a larger quantity of fire, and so on. This belief explains how they came to believe that it would be possible to convert the base metals into gold; for if the only difference between gold and copper lay in the different proportions in which their elements were mixed, and if it were possible to alter those proportions, then one metal might be converted into another. Later investigations have proved the incorrectness of this theory, and shown that matter consists of different bodies, which up to the present we have not been able to reduce to simpler forms. These are called *elements.* It does not follow that an element never will be split up, so that we must regard the term as a sort of provisional name. Up to Sir Humphry Davy's time potash and soda were regarded as elements; but he proved that they contained the metals potassium and sodium respectively, and we cannot tell but that every substance that is now called an element may be shown some day to be capable of decomposition. A substance that can be split up into simpler bodies is called a compound. From this it follows that the composition of a compound body may be demonstrated in two ways:—(*a*) We may start with the body, and break it up into simpler bodies; or (*b*) we may start with simple bodies, and cause them to combine and form the body under consideration. The first of these methods is called analysis, and the second synthesis. But it would be a very indefinite way of working if we merely found out what elements are present in a body. We require to know in what proportions by weight they are combined; hence the great importance of the balance in the study of chemistry. In fact, it is not going too far to say that the whole foundation of chemical knowledge is based upon the application by Black of the balance to chemical research. A very careful study of the composition of bodies leads us to the belief in certain laws. Of these the first is called **the law of fixed or definite proportions**, and may be thus stated:—

"The proportions in which two or more substances combine to form a given body are always fixed and constant."

Thus water always consists of eight parts by weight of oxygen and one of hydrogen; chalk consists of forty parts of the metal calcium, twelve parts of carbon, and forty-eight of oxygen.

After this fact was discovered, it became the practice to record the results of the study of the composition of bodies by reducing the weight of each constituent to a percentage of the weight of the whole. This was to a certain extent useful, but it concealed the relation of the parts to one another if we wished to compare the composition of different bodies formed of the same elements in different proportions. Thus there are two compounds of carbon and oxygen, which have the following percentage composition:—

A.		B.	
Carbon	$27\cdot\dot{2}\dot{7}$	Carbon	$42\cdot\dot{8}57\dot{1}\dot{4}\dot{2}$
Oxygen	$72\cdot\dot{7}\dot{2}$	Oxygen	$57\cdot\dot{1}42\dot{8}\dot{5}\dot{7}$
	100		100

These numbers show the relation of the weight of oxygen and of carbon to the whole, and although they enable us to see the relation of the weight of carbon to that of oxygen in each case separately, they do not enable us to compare the weight of oxygen that combines with a given weight of carbon in the two cases. If we calculate the weight of oxygen in A that combines with one part by weight of carbon, we find that it is $\frac{72\cdot\dot{7}\dot{2}}{27\cdot\dot{2}\dot{7}}$—that is, $\frac{8}{3}$. But in B we find that one part by weight of carbon combines with $\frac{57\cdot\dot{1}42\dot{8}\dot{5}\dot{7}}{42\cdot\dot{8}57\dot{1}\dot{4}\dot{2}}$—that is, $\frac{4}{3}$, or exactly a half of the amount of oxygen that combines with one of carbon in A. By making similar calculations in the case of all series of compounds that are formed from the same elements, we arrive at **the law of multiple proportions**, which is thus stated:—

"When the same elements combine to form different bodies, the proportion between their weights in one case is a simple multiple of their proportions in the other."

This law must not be confused with the law of definite proportions. The latter applies to every individual compound, while the law of multiple proportions applies to groups of compounds formed of the same elements.

If the student thoroughly understands these two laws, he will have very little difficulty in understanding the atomic theory, which was the hypothesis put forward by Dalton to account for the facts stated in these laws.

LOGIC FOR L.L.A. AND LONDON MATRICULATION.

BY T. E. MARGERISON, M.A. (LOND.),

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II.

Denotation and Connotation.—We have seen that terms may be divided into *connotative* and *non-connotative*. It is necessary that we examine the basis of this division more closely. If we consider the use of any common name such as *house*, we find that it has two functions—(1) it names a number of objects, thereby distinguishing them from all other things to which the name does not apply; (2) it implies the presence in each of the things so named of certain qualities or attributes on account of which the name is given. A term is therefore said to *denote* (L. *denotare*, to mark) a number of individual things, and to *connote* certain attributes. Hence the *denotation* of a term is the number of individual things which the term names, and its *connotation* is the sum of the attributes implied by the term. The attributes thus included in the connotation of a term are, according to Mill, those on account of which the individual possessing them is placed in the class. What properties must the animal known as *horse* possess in order that it may be given the name? The answer would state the connotation of the term *horse*. A wider meaning is given to *connotation* by some logicians: it is said to include all the attributes suggested by the name, whether actually implied or not. Jevons regards it as meaning all the attributes known or unknown possessed in common by all the members of the class.

Extension and *intension* are names sometimes used instead of *denotation* and *connotation* respectively; but these names are more correctly employed in speaking of the concepts corresponding to terms.

Connotative and Non-connotative Terms.—Words having the double function described above of denoting individuals and connoting attributes are said to be *connotative*. Every concrete general name is necessarily from its nature connotative, for it is only because of the possession in common of some attribute or attributes that such a name is given. General abstract terms—that is, those which denote a group of attributes: for example, *humanity*, *virtue*—are connotative; as also are some singular names: for example, *the highest mountain in the world*.

But not all terms have this double function. Some denote objects, but have no meaning; they are marks without any significance in themselves. The chief of these are proper nouns, and singular abstract nouns such as *whiteness*, *truth*. For take a proper noun such as *Wellington*. The word merely distinguishes an individual. There is nothing in the word to tell us of the properties of the individual; it may be a man, a town, a dog, etc. And similarly with singular abstract names: they denote the attributes which the corresponding concrete names connote, but in themselves they connote nothing.

Relation of Connotation and Denotation.—As a rule, when we increase the connotation of a term, we decrease its denotation. If we add to "book" the adjective "red," we increase the connotation; for "red book" has all the meaning of "book," with the additional attribute of "redness." As, however, the number of "red books" is less than that of "books," the denotation is decreased. If we add another adjective such as "large," we again increase the connotation and decrease the denotation. Hence it has been said that connotation and denotation vary in inverse ratio. The statement is not strictly true. In the first place, there is no regularity in the variation. The addition of some attributes considerably restricts the denotation, while others scarcely affect it: compare "white" and "blind" as applied to "men." Sometimes an addition to the connotation does not make any change in the denotation: for example, there are as many equiangular equilateral triangles as there are equilateral triangles, notwithstanding the fact that "equiangular" adds to the connotation of the term "equilateral triangle."

The Predicables.—Closely connected with the part of our subject which we have been considering is the doctrine of the *Predicables*. These are five in number, and constitute a classification of general names to express the different kinds of class relation which may exist between the subject and predicate of propositions. The five predicables are *Genus*, *Species*, *Differentia*, *Proprium*, *Accidens*.

A *genus* is a wide class made up of two or more narrower classes, each of these component classes being called a *species* of the genus. Thus "horse" is a species of the genus "animal." The terms *genus* and *species* are purely relative; we cannot class a term as genus or species without considering its relation to some other term, and the same term may be in relation to another a species, and to a third a genus. "Horse," for example, is, as we have seen, a species of "animal;" but in relation to "cart-horse," "race-horse," etc., it is a genus.

Differentia or *difference* is the excess of the connotation of the species over that of the genus. It is the attribute or attributes distinguishing a species from other species of the same genus. Thus *noun* is a species of the genus *word*, the differentia being expressed in the concluding words of the definition, "A noun is a word *used as a name*."

A *proprium* or *property* is an attribute which does not form part of the connotation of the class name, but is nevertheless found in every individual of the class, because it necessarily follows from some attribute which is part of the connotation. The definition of "parallelogram" states that it is a four-sided rectilineal figure with its opposite sides parallel. These attributes form its connotation; from them it can be proved that the opposite sides of the parallelogram are necessarily equal, and the equality of the opposite sides, an attribute found in every parallelogram, but not part of the connotation, is therefore a *proprium*.

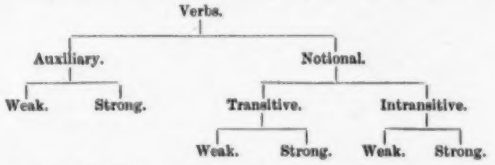
An *accidens* or *accident* is an attribute which forms no part of the connotation, nor does it necessarily follow from any part of the connotation. They are of two kinds:—(1) *inseparable*, those which are never absent, so far as we know, from the species to which they belong—for example, "blackness" in crows; (2) *separable*, those which are sometimes present, sometimes absent, in individuals of the species—as, "red-haired" of the species man.

The five-fold scheme given above was the work of Porphyry, who lived in the third century.

Division.—Logical division is the analysis of the denotation of a term by stating the sub-classes into which the class denoted by the term may be divided. The analysis is effected by seeking some attribute which belongs to one part of the class to be divided, but not to others. This attribute forms the basis or principle of the division—the *fundamentum divisionis*. Thus triangles are divided, according to the equality of their sides, into equilateral, isosceles, and scalene; and again, on another basis, into right-angled, obtuse-angled, and acute-angled.

Logical division must conform to the following rules:—

1. *Each step must have only one basis or principle of division*, otherwise the sub-classes will not exclude each other, and overlapping will result. Some objects will fall into more than one species, so that the total denotation of the species will be greater than the total denotation of the genus. For example, if verbs are divided into *auxiliary*, *transitive*, *weak* and *strong*, there are three bases for one and the same step in division, whereas there should be a separate step for each base. Thus:—



It is then impossible for any individual to fall into more than one sub-class.

2. *The species must, when added together, be co-extensive with the genus*—that is, the division must be exhaustive. The sub-classes must include all the things contained in the genus, and no more. A division violating this rule would be that of poetry into tragedy and comedy.

3. *The division must proceed step by step.* This is the old logical rule, *Divisio non faciat saltum* ("division must not make a leap"), and is necessary to ensure that no part of the denotation is omitted.

Dichotomy (lit., a division into two parts) is a method of division which at each step divides the class into two sub-classes only, denoted by a positive term and its negative. For an illustration of the process, see the well-known "Tree of Porphyry." The method ensures accuracy, but is too laborious to be of much practical value.

QUESTIONS.

(Students can have their solutions corrected by sending them, with seven stamps, to the Editor, Elementary Logic Course, PRACTICAL TEACHER.)

1. Show by examples that the division of names into *general*

and *singular* does not coincide with the division into *concrete* and *abstract*.

2. Distinguish between the *connotation* and the *denotation* of a term.

3. What classes of terms are (*a*) *connotative*, (*b*) *non-connotative?*

4. "A generic term denotes a larger number of objects than a specific term, but connotes a smaller number of attributes." Explain and illustrate this statement.

5. Define *differentia*, *proprium*, *accidens*. Illustrate by examples.

CERTIFICATE SYLLABUS FOR 1903.

We have received from the Board of Education the Syllabus and Regulations for Special Courses in connection with the Certificate Examination of 1903.

Our readers will remember that, after much delay, the Certificate Syllabus for 1903 was issued last October. This stated that, in addition to the ordinary pass examination, candidates might choose one subject from a given list, and although it would not be taken into consideration in determining the candidate's place in the class list, yet success in it would be denoted by a distinctive mark in the class list and on the parchment certificate. The *names* of eight subjects were then given, but no particulars of the amount of work required. It was distinctly stated, however, that "candidates desiring to offer a special course must give notice to the Board of Education on or before the 1st October 1902 of their intention to do so."

In July 1902 the syllabus and regulations appeared. Those candidates who have devoted their time to subjects A, F, and H have the chagrin of finding that their time has been thrown away, and that "the Board of Education have decided to restrict the subjects in which special courses may be taken to the following:—

"B. Advanced Science.
"C. Advanced Drawing.
"D. Advanced Course of Mathematics.
"E. Advanced Instruction in a language other than English.
"G. Advanced Instruction in the Theory and History of Teaching."

Although we attach very little educative value to the subject of Domestic Economy, and regard the other two subjects (A. Rural Subjects—for example, Elementary Botany and Biology in close connection with rural life and industry; F. Advanced Instruction in Kindergarten Methods) as fads, yet we do consider that a grave injustice has been done to those candidates who have applied themselves to the study of these subjects; and with all the faults of Domestic Economy as a school subject, it is certainly a very popular one.

We do wish the Board of Education would see the absurdity of requiring an interval of over two years and a half to elapse between the King's Scholarship Examination and the Certificate, and then to keep the candidates waiting a year for their general syllabus, and over eighteen months for the special syllabus. The Board seems to think that more leisure is necessary in its own portion of the business; for although it allows less than a year to study the matter set out in the syllabus, it requires nine months to enter the candidates' names, for it is distinctly laid down that "candidates desiring to offer a special course must give notice to the Secretary, Board of Education, Whitehall, on or before the 1st October 1902 of their intention to do so, and must specify which course they propose to take." The syllabus in detail can be obtained on application to the Board of Education. Its chief points are:—

B. *Advanced Science.*—Physiography *or* Biology, apparently to be taken at the May examinations.

C. *Advanced Drawing.*—According to p. 331 of the Supplementary Regulations of the Board of Education, South Kensington.

D. *Mathematics.*—Second Stage, South Kensington.

E. *Advanced Instruction in a Language.*—Candidates may offer one of the following languages:—Latin, Greek, French, German, Welsh, Hebrew, Italian, Spanish.

No set books are prescribed for study. The passages for translation into English will be of moderate difficulty, and will be taken from standard authors, both prose writers and poets, in the language selected. A wide liberty of choice will be allowed.

Candidates will also have to translate passages of English prose into the language.

A sound knowledge of grammar and syntax will be required.

G. *Advanced Instruction in the Theory and History of Teaching.*

Section A.—Advanced instruction in the Theory of Teaching.

1. The best methods of teaching each of the subjects which form part of the usual course of studies in public elementary schools. (The study of methods of teaching should, where possible, follow their historical development. The advantages and disadvantages of various methods should be viewed in the light of practical experience as well as of psychology.)

2. The leading principles of the conduct and management of public elementary schools of various kinds (boys', girls', mixed, infants'), including—

(*a*) Arrangement of buildings, playground; lighting, warming, and ventilating; sanitation; apparatus for teaching; desks and benches; registration of scholars; library; museum.

(*b*) The teacher's duties in forming the character of the scholars. Precepts and habits which lead to right conduct, viewed in the light of experience and ethical considerations.

(*c*) The construction of courses of study suited to various types of schools.

Section B.—The History of Education in the seventeenth and eighteenth centuries, with special reference to the views and work of Locke and Pestalozzi.

N.B.—Books recommended to be read:—MacCunn's *Making of Character*, James's *Talks to Teachers*, Quick's *Educational Reformers*, Welton's *Logical Bases of Education*, Fitch's *Lectures on Teaching*.

These books will not form the subjects of examination. They are recommended solely with the view of indicating to students some of the sources of information on the subjects in which they will be examined. They are advised to consult other books dealing with the theory, practice, and history of education.

In the examination some questions will be set specially designed for teachers of infants.

TRAINING COLLEGE CURRICULUM, 1902-4.

The Board of Education has issued a circular to the training colleges, inviting them to submit for approval the course of study proposed to be taken by the students who will enter the colleges in September next.

For the examination in 1904 it has been decided to modify the Outline Course set out in Circular 454 of 19th June 1901, mainly for the purpose of arranging the subjects in groups. The subjects will in future be grouped as follows:—

A. Preliminary or qualifying subjects, which will be tested by inspection and oral examination, but not, as a rule, by written examination—

1. Reading.
2. Blackboard Drawing.
3. Music.
4. Manual Instruction (for men) *or* Needlework (for women).
5. Physical Training.
6. Practical Elementary Science, including Nature Study.

B. The Practice of Teaching.

C. Four obligatory subjects, in which written examinations will be held—

1. Theory of Teaching.
2. English Language and Literature, and History and Geography.
3. Composition.
4. Arithmetic and Easy Mathematics.

D. Optional Subjects, in which honours can be obtained. Such subjects may be—

1. A Language.
2. Advanced Science.
3. Advanced Mathematics, etc.

Not more than two of these honour subjects may be offered by any student.

The Board of Education do not desire to depart from the principle laid down last year in Circular 454 of allowing freedom to training colleges to frame their own courses of study within certain broad limits. But in the subjects in which written examinations are to be held, and particularly in Subject 2 of Group C, it may be found necessary in some cases to restrict the liberty which was allowed last year.

Students entering training colleges under Article 115 (*c*) of the Code, and students offering University Examinations, will continue to be exempted from certain subjects of the Outline Course on similar conditions to those of last year.

OUR QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Subscriber (Colombo).—We do not think you can do better than use Fasnacht's *Synthetic French Grammar*. It is drawn up on sound lines, and a teacher will appreciate its excellences as well as a student. Brachet's *French Grammar* is also a very good one.

Ixion.—The answer you send is quite correct, on the supposition that the square has perfect freedom of motion, which appears to be intended. The last two answers given by Hicks are obviously inaccurate, since they do not reduce to the values for an inelastic particle when we put $e = o$. We are glad that solution given set you on right track.

J.A.—The electrodes of a quadrant electrometer are joined to the terminals of a battery of 5 cells in series. In what ratio will the deflection of the needle be altered if the electrodes are *also* joined to the terminals of a battery of 3 cells in series similarly arranged, all of the cells being alike, and the connecting wires thick?

(Science and Art Dep. Elect. and Mag. Adv., 1899.)

Let E be the E.M.F. of each cell, and r its internal resistance. In the first arrangement no current is produced, and the deflection of the electrometer is proportional to 5E.

In the second case the two sets of cells form a closed circuit, a current is produced, and the deflection of the electrometer is proportional to the difference of potential between the terminals of the 3 cells.

If the positive poles of both batteries are joined to the same terminal of the electrometer, the resultant E.M.F. in the circuit is equal to $(5 - 3)\mathrm{E} = 2\mathrm{E}$, and the resistance in the circuit is equal to $(5 + 3)r = 8r$. Hence the current produced is equal to

$$\frac{2\mathrm{E}}{8r} = \frac{\mathrm{E}}{4r},$$

and the drop of potential, due to energy lost in heating the 3 cells, is equal to *current* × *resistance*—that is, to

$$\frac{\mathrm{E}}{4r} \times 3r = \frac{3\mathrm{E}}{4}.$$

The drop of potential, due to energy stored up in the 3 cells, through which the current flows in a reversed direction, is equal to 3E.

$$\therefore \text{ P.D. between terminals of 3 cells} = 3\mathrm{E} + \frac{3\mathrm{E}}{4} = \frac{15\mathrm{E}}{4}.$$

Hence the deflection of the electrometer will be diminished in the ratio $\frac{15}{4} : 5 = 3 : 4$.

If the positive terminal of the 3-cell battery is joined to the same terminal of the electrometer as the negative terminal of the 5-cell battery, the resultant E.M.F. in the circuit is equal to 8E, and the current produced is equal to

$$\frac{8\mathrm{E}}{8r} = \frac{\mathrm{E}}{r}.$$

In this case the chemical action of the 3 cells supplies energy to the circuit, while the heating of the cells subtracts energy from the circuit. Thus the P.D. between the terminals of the 3 cells will be equal to

$$3\mathrm{E} - \frac{\mathrm{E}}{r} \times 3r = 3\mathrm{E} - 3\mathrm{E} = 0.$$

Thus there will, in this case, be no deflection of the quadrant electrometer.

Molim.—If $x = \sqrt{3} + \sqrt{5}$, find in its simplest surd form with a rational denominator the value of $\dfrac{x}{1 + x + x^2}$.

Extract the square root of $a^2 + a\sqrt{(a^2 - 2)} - 1$.

If $x = \sqrt{3} + \sqrt{5}$, then

$$\frac{x}{1 + x + x^2} = \frac{\sqrt{3} + \sqrt{5}}{1 + \sqrt{3} + \sqrt{5} + (\sqrt{3} + \sqrt{5})^2}$$

$$= \frac{\sqrt{3} + \sqrt{5}}{1 + \sqrt{3} + \sqrt{5} + 8 + 2\sqrt{15}}$$

$$= \frac{\sqrt{3} + \sqrt{5}}{9 + \sqrt{3} + \sqrt{5} + 2\sqrt{15}}$$

$$= \frac{(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})}{(9 + \sqrt{3} + \sqrt{5} + 2\sqrt{15})(\sqrt{5} - \sqrt{3})}$$

$$= \frac{2}{3\sqrt{5} + \sqrt{3} + 2}$$

$$= \frac{2(3\sqrt{5} - \sqrt{3} - 2)}{(3\sqrt{5} + \sqrt{3} + 2)(3\sqrt{5} - \sqrt{3} - 2)}$$

$$= \frac{2(3\sqrt{5} - \sqrt{3} - 2)}{45 - (\sqrt{3} + 2)^2}$$

$$= \frac{2(3\sqrt{5} - \sqrt{3} - 2)}{45 - 7 - 4\sqrt{3}}$$

$$= \frac{3\sqrt{5} - \sqrt{3} - 2}{19 - 2\sqrt{3}}$$

$$= \frac{(3\sqrt{5} - \sqrt{3} - 2)(19 + 2\sqrt{3})}{19^2 - 12}$$

$$= \frac{(3\sqrt{5} - \sqrt{3} - 2)(19 + 2\sqrt{3})}{361 - 12}$$

$$= \frac{6\sqrt{15} + 57\sqrt{5} - 23\sqrt{3} - 44}{349}$$

Let $\sqrt{\{a^2 + a\sqrt{(a^2 - 2)} - 1\}} = \sqrt{x} + \sqrt{y}$.

Then $a^2 - 1 = x + y$, $a\sqrt{(a^2 - 2)} = 2\sqrt{xy}$.

Hence $(x + y)^2 = (a^2 - 1)^2$, $4xy = a^2(a^2 - 2)$.

$$\therefore (x - y)^2 = (a^2 - 1)^2 - a^2(a^2 - 2) = 1.$$

$$\therefore x - y = 1.$$

But $x + y = a^2 - 1$,

$$\therefore x = \frac{a^2}{2},$$

and $y = \dfrac{a^2 - 2}{2}$.

Hence $\sqrt{\{a^2 + a\sqrt{(a^2 - 2)} - 1\}} = \dfrac{a + \sqrt{a^2 - 2}}{\sqrt{2}}$.

Bike.—Show that the curves

$$y = x^{n+1}(x-a)(x-b)$$
$$y = x^{n+1}(x-c)(x-d)$$

have contact of the nth order at the origin.

For the curves to have contact of the nth order at the origin, the nth differential co-efficients of the two values of y must be equal when $x = 0$.

$$y = x^{n+1}(x-a)(x-b) = x^{n+2} - (a+b)x^{n+2} + abx^{n+1}$$

$$\frac{d^n y}{dx^n} = (n+3)(n+2) \ldots (4)x^2 - (a+b)(n+2)(n+1) \ldots (3)x^2 + ab(n+1)(n) \ldots (2)x.$$

When $x = 0$, $\frac{d^n y}{dx^n} = 0$.

Now let $y = x^{n+1}(x-c)(x-d) = x^{n+2} - (c+d)x^{n+2} + cdx^{n+1}$

$$\frac{d^n y}{dx^n} = (n+3)(n+2) \ldots (4)x^2 - (c+d)(n+2)(n+1) \ldots (3)x^2 + cd(n+1)(n) \ldots (2)x.$$

When $x = 0$, $\frac{d^n y}{dx^n} = 0$.

Thus the nth differential co-efficients of the two values of y are equal when $x = 0$, and the curves have contact of the nth order at the origin. It is easily proved that they have not contact of the $(n+1)$th order at the origin by showing that the $(n+1)$th differential co-efficients are respectively equal to—

$$ab(n+1)(n) \ldots . (2)(1),$$

and $cd(n+1)(n) \ldots . (2)(1)$,

when $x = 0$.

Spes.—Two particles start simultaneously from A, B, two of the angular points of a square ABCD, in the direction AB, BC, and describe the periphery with constant velocities V, v, respectively, where V is greater than v, until one particle overtakes the other. Prove that the minimum distances between the particles occur at equal intervals of time, and that if V : v :: $m+1$: m where m is an integer, the sum of all the minimum distances is $\frac{m(m+1)}{2\sqrt{m^2+(m+1)^2}} \times$ (a side of the square).

(Cambridge Mathematical Tripos, 1871.)

At the end of any time t, let P denote the position of the particle which moves with velocity V, and Q the position of that which moves with velocity v, and suppose that at the same instant P is in the nth side of the square reckoned from A circuitally in the direction AB, BC, CD, DA, etc., and Q in the $(n+1)$th side; then, if the shortest distance between P and Q be denoted by s, we shall have—

$$s = [\{na - \mathrm{V}t\}^2 + \{vt - (n-1)a\}^2]^{\frac{1}{2}},$$

where a is the length of a side of the square.

Then, equating $\frac{ds}{dt}$ to zero, we have—

$$2(na - \mathrm{V}t)(-\mathrm{V}) + 2\{vt - (n-1)a\}v = 0.$$

Hence s is a minimum when—

$$t = \frac{n\mathrm{V} + (n-1)v}{\mathrm{V}^2 + v^2} \cdot a.$$

Hence the minimum distances between the particles occur at equal intervals of time, each of which is given by the expression $\frac{\mathrm{V}+v}{\mathrm{V}^2+v^2} \cdot a$.

Again, representing by s_n the minimum distance which occurs at the time t_n, we have—

$$s_n = [\{na - \mathrm{V}t_n\}^2 + \{vt_n - (n-1)a\}^2]^{\frac{1}{2}}.$$

Substituting the value for t_n found above, we have—

$$s_n = [\{na - \mathrm{V}\frac{n\mathrm{V} + (n-1)v}{\mathrm{V}^2+v^2} \cdot a\}^2 + \{v\frac{n\mathrm{V} + (n-1)v}{\mathrm{V}^2+v^2}a - (n-1)a\}^2]^{\frac{1}{2}}$$

$$= \frac{[\{n\mathrm{V}^2 + nv^2 - n\mathrm{V}^2 - (n-1)\mathrm{V}v\}^2 + \{n\mathrm{V}v + (n-1)v^2 - (n-1)v^2 - (n-1)\mathrm{V}^2\}^2]^{\frac{1}{2}}}{\mathrm{V}^2+v^2} \cdot a$$

$$= [\{nv - (n-1)\mathrm{V}\}^2v^2 + \{nv + (n-1)\mathrm{V}\}^2\mathrm{V}^2]^{\frac{1}{2}} \frac{a}{\mathrm{V}^2+v^2}$$

$$= \{nv - (n-1)\mathrm{V}\}(\mathrm{V}^2+v^2)^{\frac{1}{2}} \cdot \frac{a}{\mathrm{V}^2+v^2}$$

$$= \frac{nv - (n-1)\mathrm{V}}{(\mathrm{V}^2+v^2)^{\frac{1}{2}}} \cdot a$$

But by question $v = \frac{m}{m+1} \cdot \mathrm{V}$.

$$\therefore s_n = \frac{n\frac{m}{m+1}\mathrm{V} - (n-1)\mathrm{V}}{\left\{1 + \frac{m^2}{(m+1)^2}\right\}^{\frac{1}{2}} \cdot \mathrm{V}} \cdot a$$

$$= \frac{m-n+1}{\sqrt{m^2+(m+1)^2}} \cdot a.$$

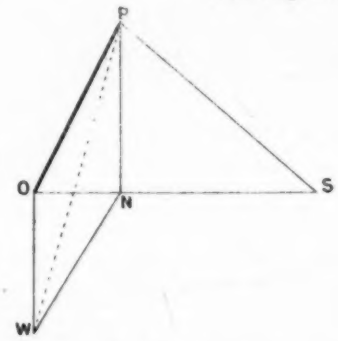
Hence the sum of the minimum distances

$$s_1 + s_2 + s_3 + \ldots + s_n + \ldots$$
$$= \{m + (m-1) + (m-2) + \ldots + 1\} \frac{a}{\sqrt{m^2+(m+1)^2}}$$
$$= \frac{m(m+1)}{2\sqrt{m^2+(m+1)^2}} \cdot a. \quad Q.E.D.$$

Carrett.—A telegraph post leans towards the south and makes an angle θ with the vertical. When viewed from the west, at the distance a from the foot, the angular elevation is α. When viewed from the south, at a distance b from the foot, the angular elevation of the top is also α. Show that

$$\tan\theta = \frac{b^2-a^2}{b^2+a^2}\cot\alpha.$$

(Cambridge Senior, 1899.)



Let OP represent the post; W, S respectively the stations west and south of O; and let N be the foot of the perpendicular from P on OS.

Join WN, WP. Then by the question $\angle$ OPN = θ, $\angle$ PWN = α; also $\angle$ PSN = α, OW = a, and OS = b.

Let x = ON, and h = PN.

Then taking the angle PSN, we have

$$\frac{h}{b-x} = \tan\alpha \ldots\ldots (1) \ldots$$

Again, from the right-angled triangle PNW we have $\frac{\mathrm{PN}}{\mathrm{NW}} = \tan\alpha$. And NW = $\sqrt{(\mathrm{WO}^2 + \mathrm{ON}^2)} = \sqrt{(a^2+x^2)}$.

$$\therefore \frac{h}{\sqrt{(a^2+x^2)}} = \tan\alpha \ldots\ldots (2) \ldots$$

Hence we have $\frac{h}{\sqrt{(a^2+x^2)}} = \frac{h}{b-x}$.

$$\therefore a^2 + x^2 = (b-x)^2 = b^2 - 2bx + x^2.$$
$$\therefore 2bx = b^2 - a^2.$$
$$\therefore x = \frac{b^2-a^2}{2b} \ldots\ldots (3) \ldots$$

From the triangle PNO we have—

$$\frac{x}{h} = \tan\theta.$$
$$\therefore \frac{x}{\tan\theta} = h.$$

But from (1), $h = b\tan\alpha - x\tan\alpha$.

$$\therefore \frac{x}{\tan\theta} = b\tan\alpha - x\tan\alpha.$$
$$\therefore x\left(\frac{1}{\tan\theta} + \tan\alpha\right) = b\tan\alpha;$$

that is, $x(\cot\theta + \tan\alpha) = b\tan\alpha$.

But from (3), $x = \frac{b^2-a^2}{2b}$.

$$\therefore \frac{b^2-a^2}{2b} = \frac{b\tan\alpha}{\cot\theta + \tan\alpha}.$$

$$\therefore \frac{2b^2}{b^2 - a^2} = \frac{\cot\theta + \tan\alpha}{\tan\alpha}.$$

Subtract 1 from both sides, and we have—

$$\frac{b^2 + a^2}{b^2 - a^2} = \frac{\cot\theta}{\tan\alpha}.$$

Hence $$\tan\theta = \frac{b^2 - a^2}{b^2 + a^2} \cdot \cot\alpha. \quad Q.E.D.$$

Caliga.—Show how to express

$$a\cos\theta + b\sin\theta$$

as the numerical multiple of a sine or cosine of an angle which is expressible as a function of the first degree in θ, and apply the result to solve the equation

$$7\cos\theta + 9\sin\theta = 8,$$

giving the value of θ in degrees, minutes, and seconds.
(University College, 1899.)

Let $a\cos\theta + b\sin\theta = n\sin(\theta + x)$.
Expanding R.H., we have

$$a\cos\theta + b\sin\theta = n\sin\theta\cos x + n\cos\theta\sin x.$$

Equating coefficients of like terms, we have

$$n\sin x = a,\ n\cos x = b.$$

$$\therefore \tan x = \frac{a}{b}.$$

$$\text{Also } n^2(\sin^2 x + \cos^2 x) = a^2 + b^2.$$

$$\therefore n = \sqrt{a^2 + b^2}.$$

$$\text{Hence } a\cos\theta + b\sin\theta = \sqrt{a^2 + b^2}\sin\left(\theta + \tan^{-1}\frac{a}{b}\right).$$

Applying this result to the L.H. side of the given equation, we have

$$7\cos\theta + 9\sin\theta = \sqrt{7^2 + 9^2}\sin\left(\theta + \tan^{-1}\frac{7}{9}\right).$$

$$\therefore \sqrt{130}\sin\left(\theta + \tan^{-1}\frac{7}{9}\right) = 8.$$

$$\log 7 = 0{\cdot}8450980$$
$$\log 9 = 0{\cdot}9542425$$
$$\overline{1}{\cdot}8908555$$
$$\log\tan 37^\circ\,52' = \overline{1}{\cdot}8907254$$
$$\overline{\cdot 0001301}$$
$$60$$
$$\overline{\cdot 0078060}(29{\cdot}94$$

Diff. for $1' = \cdot 0002607$

$$5214$$
$$\overline{25920}$$
$$23463$$
$$\overline{2457}$$
$$23463$$
$$\overline{1100}$$

$$\therefore \tan^{-1}\frac{7}{9} = 37^\circ\,52'\,29''{\cdot}9.$$

$$\text{Hence } \sin(\theta + 37^\circ\,52'\,29''{\cdot}9) = \frac{8}{\sqrt{130}}.$$

$$\log 8 = 0{\cdot}9030900$$
$$\log\sqrt{130} = 1{\cdot}0569717$$
$$\overline{1}{\cdot}8461183$$
$$\log\sin 44^\circ\,33' = \overline{1}{\cdot}8460471$$
$$\overline{\cdot 0000712}$$
$$60$$
$$\overline{\cdot 0042720}(33{\cdot}3$$

Diff. for $1' = \cdot 0001283$

$$3849$$
$$\overline{4230}$$
$$3849$$
$$\overline{381}$$

$$\therefore \theta + 37^\circ\,52'\,29''{\cdot}9 = 44^\circ\,33'\,33''{\cdot}3.$$
$$\therefore \theta = 6^\circ\,41'\,3''{\cdot}4.$$

C. H. Stokes.—Would you kindly say in your Query Column whether the following sentence is admissible:—"A quarter's notice or a quarter's fees is required before a pupil's withdrawal." Observe, it is not whether there is a more common, a more correct, or a more elegant usage. Is the given example grammatically justifiable? Perhaps, as an example of zeugma (which with many covers ellipsis), it may stand. Dr. Angus (*Handbook of English Tongue*, § 375) says: "When two nominatives of different numbers are separated by 'or' or 'nor,' the verb is *generally* in the plural, and it is then *convenient* to place the plural nominative next the verb." This is not how the rule is usually stated; but, as West says (*Elements of English Grammar*, Pitt Press), in Angus's book "the principles of syntax are discussed with more than ordinary detail." Milton (*Paradise Lost*, iii.) writes: "Not to me returns day or night or flocks or herds," a line which violates the rule as enunciated in many books.

We had rather our correspondent had not narrowed his inquiry as he has done. The dictum of Horace applies with the utmost force to the grammar of English—*usus et jus et norma loquendi*; and this being so, there is very little need to cite writers on grammar as authorities for or against any particular usage. And even the appeal to usage is not final, for there is a certain difficulty in determining it. We are no precisians in matters of English grammar, preferring to regard many of our grammatical usages as regulated by considerations of taste rather than by strict rule either of logic or use.

The negative is, in nearly all languages, a fruitful source of grammatical anomaly, strikingly so in French, and it is well to avoid dogmatic statements as to the accuracy of sentences in which negatives appear. Our opinion, however, is that the rule as quoted from Angus's Handbook is sensible and good, although in the particular sentence submitted by our correspondent we do not think it would be an improvement to substitute "are" for "is." If a ruling is insisted on—*yes* or *no*—we should say that the sentence is *not* strictly justifiable, but that as a *constructio ad sensum* it may pass. Our emendation—without in any way recasting the sentence or altering the order of words—would be to put "or a quarter's fees" in parenthesis.

Arum.—Assuming that

$$\log(1 + x) = c_0 + c_1x + c_2x^2 + \ldots.$$

determine the values of the coefficients by equating the separate terms in the expansion in series of the identity.

Writing $x = 0$ in the given expression, we find $c_0 = 0$, since $\log(1)$ is zero.

Differentiating, we obtain the relation

$$(1 + x)^{-1} = c_1 + 2c_2x + 3c_3x^2 + \ldots. + nc_nx^{n-1} + \ldots.$$

Expanding L.H. side, we have

$$1 + \frac{(-1)}{1}x + \frac{(-1)(-2)}{1.2}x^2 + \frac{(-1)(-2)(-3)}{1.2.3}x^3 + \ldots.$$
$$= c_1 + 2c_2x + 3c_3x^2 + \ldots.$$

Hence, equating the coefficients of like powers of x, we have

$$c_1 = 1,$$
$$c_2 = -\tfrac{1}{2},$$
$$c_3 = \tfrac{1}{3},$$
$$\ldots. = \ldots.,$$
$$c_n = (-1)^{n-1}\cdot\frac{1}{n},$$
$$\ldots. = \ldots.$$

$$\therefore \log(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots. + (-1)^{n-1}\frac{x^n}{n} + \ldots.$$

See also C. Smith's *Treatise on Algebra*, § 308.

Bike.—

$$\text{Tan}(\lambda^1 - \lambda) = \frac{e^2\sin\lambda\cos\lambda}{1 - e^2\cos^2\lambda}.$$

Since $(\lambda^1 - \lambda)$ is a very small angle, we may take $(\lambda^1 - \lambda) = \tan(\lambda^1 - \lambda)$, approximately. (See Todhunter's *Trigonometry*, § 118.) Also, since e^2 is very small, we may neglect the second term in the denominator of the expression on the R.H. side.

Hence $(\lambda^1 - \lambda) = e^2\sin\lambda\cos\lambda$, approximately.

OUR SCIENCE SECTION

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PHYSIOGRAPHY.

(ADVANCED AND HONOURS.)

The Causes of Variability in Stars.—Mr. W. T. Lynn, B.A., F.R.A.S., brought under the consideration of the Astronomical Society the following remarks concerning this subject:—"*In limine* I except from its scope (that is, the scope of his theory) all stars of the Algol type. The theory suggested by Goodriche, when he discovered the variability of that remarkable object, that this was caused by the periodic interposition of an opaque body, in the manner of a partial eclipse, has been in our own time fully confirmed by spectroscopic observations, and no doubt can remain that this is the principal cause of variability in stars of this type. They form, however, but a small proportion of all the variable stars now known, and the question is, especially with regard to those subject to regular periodic mutations of brightness, what is the cause of this? Probably the balance of opinion is that it is due to some physical changes in the stars themselves, and that its analogue is to be found in the eleven-year period of spots now recognised (though not accounted for) in our own sun. If so, however, it must be on a much larger scale in nearly all the variable stars; for I suppose it may be safely affirmed that changes of brightness similar to those on the sun's surface, produced by the varying sizes and numbers of the solar spots, would not be noticed at stellar distances."

Mr. Lynn's Theory.—"To come to my suggestion, tentatively offered for discussion. It is now somewhat more than a century ago that Laplace brought forward what was known as the nebular hypothesis about the same time that Sir W. Herschell was bringing to light the existence of thousands of nebulous objects, some of which were thought to be star-clusters at greater than star distances, but others presented no appearance of resolvability, and might not improbably be regarded as nebulous masses at some future time to be condensed or formed into systems similar to our solar system. Laplace's suggestion was that the latter had once been a nebulous mass in rotation; that, as it rotated, portions were separated from the great mass; that these became rings of matter which gradually condensed and became opaque; and that the rings by degrees coalesced into spherical opaque bodies revolving round the parent mass, and thus formed themselves into planets as we know them. Although it is thought that the hypothesis, as put forward by Laplace, needs several modifications in detail, in its main lines it is so generally accepted that it is called the Nebular Theory. Now let us suppose that a nebulous mass has proceeded far on its progress towards condensation, and that a ring of opaque matter (consisting, like Saturn's rings, of discrete particles or tiny satellites) is revolving round it, and coalescing into a planetary body. Such a rotating series of bodies coming between us and the central mass would cut off a part of its light; and if it were of varying degrees of density in its annulus, the effect would be a diminution of brightness in the central luminous mass as we were looking through the parts farther and farther away from the incipient planet, and an increase as we were again looking through the parts of the annulus nearer and nearer to it. When the annulus had become a fully-formed planet, the diminution and reincrease of brightness would occupy only a portion of the whole period of change, and the phenomena would be those of a star of the Algol type. But whilst the annulus was still complete, although in a portion its amount of matter might be very small compared with the rest, the changes in brightness would be continuous throughout the whole period. Of course we must suppose that the portions separated from (or abandoned by) the original nebulous mass are much larger in proportion to the whole than has obtained in our solar system; but there seems no reason why, in many cases, this should not be so. If we accept the view that variability in stars is caused by periodical physical changes in them, we must also suppose that these changes are of a much more powerful kind than those exhibited by the periodicity of spots in our sun. Uniformity in action, but diversity in scale, is surely what Nature leads us to expect in her multitudinous operations."

Recent Changes in the Surface Markings of Mars.—M. Antoniadi recently gave in *Knowledge* an interesting account, with illustrations, of some changes in the surface markings of Mars, of which the following are the chief:—

1. The unaccountable disappearance of Aonious Sinus since the opposition of 1892.
2. The fading of the canal Nelosyrtis, once the darkest.
3. The bridging of Syrtis Major by Nili Pons.
4. The formation of the canal Nasamon.
5. The great faintness of the Cerberus in 1894, and its extraordinary darkness during the oppositions of 1898–9 and 1900–1.
6. The increased darkness of the canals Amenthes and Niloheras.
7. The darkness of Phlegra, Cerebrenic Ætheria, and Utopia, together with the formation of the Copais Lacus.

It is thought that some of these changes, occurring as they do in the equatorial zone of Mars, can scarcely be accounted for by mere seismal changes. They cannot be charged to observational errors nor mere cloud formations. It is difficult to find any acceptable explanation of them at all.

Mountains and Hail.—The influence of mountains on the fall of hail has frequently been the subject of controversy, but up to the present time no certain conclusion appears to have been arrived at. The Italian Meteorological Office has recently published an interesting note upon the question by Professor V. Monti. The positions chosen were, perhaps, the most suitable for the purpose of any among the Italian network of stations—namely, the Collegio Romano and Montecavo, an isolated station near Rome, situated at an altitude of about 1,000 meters. The complete observations at both stations for the years 1880–87 are contained in the annals of the Italian Meteorological Office. During this period 41 days of hail were recorded at Rome, against 80 at Montecavo. The monthly values show two maxima (in April and October) and two minima (in July and December) as regards the excess of days of hail at the mountain station. A comparison of days of thunderstorms shows, on the other hand, that there were 76 such storms at Rome, against 29 at Montecavo. This seems to show that the excess of hail at the mountain station is not attributable to a greater intensity of atmospheric electricity. The author gives a table showing that the monthly mean temperature at Rome is at times 10° higher than at Montecavo, and suggests that the fusion of hail traversing a warmer stratum of air may account for the smaller amount at Rome.

Motion of the Pole.—In No. 523 of the *Astronomical Journal*, Dr. J. C. Chandler directs attention to the apparent existence of a fifteen months' periodical motion of the pole, which has not yet been identified. This apparent motion is so minute (0″·05) that Dr. Chandler hesitates to assert its real existence, but at the same time he cannot account for the constant differences in the co-ordinates by any other supposition, and he summarises his article with the following statement:—"In dealing with a phenomenon so obviously complex as these motions of the earth's axis are, and until we are certain of the superior limit of precision in astronomical measurement, it would be unphilosophical to ignore without examination such indications as these."

Southern Approach of Icebergs.—Perhaps the most singular statement in the Meteorological Office pilot chart for the month of August is that relating to the appearance, early in July, of a

fairly large ice-floe, 40 feet by 15 feet, and a foot out of water, off the west of Scotland, close inshore on the Treshnish Islands, on the west side of Mull, and only a few miles from Tobermory. From other sources it appears that the fishermen who saw it could not be mistaken, as they sailed within 20 feet of the floe. It was reported by independent observers on two days. There can be little doubt that it was the remains of one of the icebergs which had for some time been infesting the coast of Iceland; but it would be interesting to trace its movements southward. Off Mull it was travelling in a north-easterly direction, so it is reasonable to suppose that it had at first drifted southward outside the Hebrides before the northerly winds which prevailed so long earlier in the season.

The Encroaching Sea.—The fact that the Board of Trade has appointed an inspector to visit Kilnsea next week calls attention to the seriousness of the erosion on the Holderness coast. When it is mentioned that during the last few centuries some four miles of land have been carried away by the sea, the importance of the matter will be appreciated. In this particular case forty-three miles are affected—from Spurn defence station to Flamborough. Kilnsea Church has been completely submerged by the sea. At Easington, from 1852 to 1876, the recorded loss of land was five yards per annum. At Dimlington, slightly further north, the rate of encroachment has been thirty-five per annum. Still farther north the sea took three yards per annum. The township of Withernsea has suffered greatly. In 1876 the inroad was at the rate of six yards per annum. Manor Newsam has been carried away. Monkwite, which covered two hundred and forty acres, has been swallowed up; at Ringborough seventy yards have been lost in the last twenty-four years; and at Aldborough the church site is far out at sea. Taking other places on the coast, south-east of Skipsea a village has been completely lost in the sea; and to the north of this point, and directly opposite to Skipsea, the village of Hyde long since became a victim of the sea. Other villages which have gone without any trace hardly being left behind include Auburn and Wilsthorpe. The Humber will soon become threatened. The Wash is becoming shallower and shallower. The river outlets are nearly choked with mud at low tide, while at high water the fertile parts of the interior are in constant danger of being flooded by the rush of the sea.

CHEMISTRY.

(ADVANCED AND HONOURS.)

BY T. CARTWRIGHT, B.A., B.SC.

Iodine and Tellurium.—The question as to whether iodine or tellurium possesses the larger atomic weight has given rise to many researches since Mendelief pointed out that the conclusion drawn from the periodic system was opposed to the experimentally determined facts. This work has hitherto been principally devoted to tellurium, partly because, as the rarer and lesser known element, tellurium might possibly contain elements of higher atomic weight, but chiefly because the work of Stas in regard to iodine appeared so convincing that further determinations of this constant for iodine would be superfluous. Since all the work done in tellurium tends to show that its atomic weight is decidedly higher than that of iodine, Professor Ladenburg has attacked the question from the other side, and has redetermined the atomic weight of iodine, using methods of purification differing from those adopted by Stas. The result is almost absolute agreement with the usually accepted figure, so that the discrepancy between the conclusions of the periodic law and the results of experiments still remains unexplained.

Polonium.—The current number of the *Berichte* contains a paper by Dr. W. Marckwald on polonium, the radioactive constituent of bismuth. The discoverers of these radioactive elements, M. and Mme. Curie, after numerous attempts to isolate this element, concluded that polonium is a species of active bismuth, and that there is as yet no proof that it contains a new element. Dr. Marckwald, after numerous fruitless experiments, has succeeded in obtaining a minute amount of polonium in a manner which would appear to exclude the possibility of its identity with bismuth. Starting with some kilograms of residues from pitchblende, about one per cent. of strongly radioactive bismuth oxychloride was obtained, and it was proved that this activity remained unchanged after several months. The acid solution of this was then treated with a stick of pure metallic bismuth, the metal becoming after some time coated with a black deposit. It was found that the activity of this deposit, as measured by the electroscope, far exceeded that of the original solution, the residue solution having lost its activity during the deposition. No deposit was seen when a second stick of bismuth was placed in this exhausted solution. The total weight of polonium obtained was only five milligrams, corresponding to an amount not exceeding one gram per ton of pitchblende. The author hopes to be able to obtain sufficient material to carry out an atomic weight determination.

Gaseous Antimony Hydride.—Although the fact of the existence of a gaseous antimony hydride has been known for many years, it is only comparatively recently that it has been obtained in the pure state, and the accounts of the stability of the pure hydride differ considerably. Thus, according to Olsyovski, who first succeeded in solidifying the gas, decomposition with separation of antimony occurs readily even at – 90° C. The current number of the *Berichte* contains a paper on this subject by A. Stock and W. Doht. In order to obtain as rich a gas as possible, they made a careful examination of the gas evolved from a series of alloys of antimony with zinc, sodium, calcium, and magnesium, and they found that the magnesium alloy was much the best for the purpose. Thus, whilst the zinc-antimony alloys never yielded a gas containing more than one per cent. of the hydride, an alloy of one part of antimony with two of magnesium gave hydrogen containing from 10·4 to 14 per cent. of the antimony hydride. From this mixture the pure gas was easily solidified out with liquid air, melting at – 88° C. and boiling at – 17° C. The solid melts to a clear liquid, and evaporates without leaving any trace of antimony, and, in fact, the gas may be kept at the ordinary temperature for some hours before decomposition sets in.

New Method of Preparing Oxygen.—Pure oxygen is readily obtained by the action of water in a Kipp's or similar apparatus on compressed sodium peroxide, mixed before compression with the calculated quantity of a soluble permanganate or hypochlorite, or with traces of a nickel or cobalt salt. The peroxide $KNaO_2$, obtained by the action of air on the liquid alloy of sodium and potassium, may be employed for the same purpose.

Volumetric Estimation of Silver.—To the solution containing the silver to be estimated, slightly acidulated with nitric acid, a ferrous as well as a ferric salt is added; at least as much iron must be in each of these salts as there is silver to estimate. Then, by means of a graduated burette, a titrated solution of iodine is added, coloured blue with starch; this solution should be added gradually, with frequent stirring. The burette is read off at the moment when the colouration persists. The reaction is as follows:—

$$2AgNO_3 + 2Fe(NO_3)_2 + I_2 = 2AgI + Fe_2(NO_3)_6.$$

Persulphuric Acid.—Communication to the Royal Society by Professor Armstrong.—Although it was observed by Faraday in 1834 that "if the acid were very strong, a remarkable disappearance of oxygen took place" on electrolysing aqueous solutions of sulphuric acid, it was not until 1878 that its disappearance was at all satisfactorily accounted for by Berthelot's discovery of *persulphuric acid*.

Berthelot's Work.—Only the anhydride S_2O_7 was isolated by Berthelot, but he concluded that the corresponding acid was formed (1) on dissolving the anhydride in water, (2) on electrolysing strong solutions of sulphuric acid, and (3) by the combination of hydrogen peroxide and ordinary sulphuric acid. The correctness of these conclusions appears to have been regarded as beyond question after Marshall had discovered in 1891 that well-defined salts of "Berthelot's acid" could be prepared by electrolysing solutions of potassium or ammonium hydrogen sulphate.

Caro's Work.—Doubt arose, however, when Caro, in 1898, discovered that if Marshall's salts were acted upon by H_2SO_4, a new acid was obtained, having different properties from Berthelot's acid. Caro's acid soon acquired importance as an oxidising agent.

Baezer and Villiger.—Having found that Caro's acid liberated iodine very rapidly, whereas Berthelot's acid acted but slowly upon iodides, Baezer and Villiger devised a process whereby one acid could be estimated in the presence of the other. By removing H_2SO_4 by means of barium phosphate, they determined these amounts, and concluded from them that the ratio of sulphur to active oxygen in Caro's acid was $SO_3 : O = 1 : 1$, and from this the formula H_2SO_5 ($= H_2O_2 . SO_3$) was deduced.

Lowry and West determined the equilibrium subsisting between H_2O_2 and persulphuric acid in the presence of H_2SO_4 and water, and found that the ratio which the water bore to the total persulphuric acid was entirely dependent on the ratio which the water bore to the H_2SO_4. The experimental curve approximated closely to a curve deduced from an equation of the fourth order, and, assuming that the chief product was a persulphuric acid of the series $H_2O_2 . nSO_3$, it was regarded as the

fourth of the series—namely, $H_2O_2 . {}_4SO_3$. But there were indications of the presence of some other acid.

These results applied to concentrated solutions. Baezer and Villiger had used dilute solutions. It was possible, then, that the product examined by Baezer and Villiger had been formed by the hydrolysis of the "higher" acid of Lowry and West.

Now the salt of a dibasic acid like H_2SO_5 would remain neutral on withdrawal of the peroxide oxygen salts, and higher acids would yield H_2SO_4 when decomposed, and a carefully neutralised solution of Caro's acid *did* become acid when heated, the ratio of the increase in acidity to the active oxygen lost being $SO_3 : O$—that is, 1 : 2, which agrees with the formula $H_2S_2O_8$, but not with H_2SO_5. Further experiments have confirmed these views.

As there was nothing to justify the belief that a third persulphuric acid was present in the solution, Lowry and West called Caro's acid pertetrasulphuric acid, and the simple acid they regarded as being found in Marshall's salts. Later work has removed the limitation, and now we regard a third acid as absolutely needed to explain the facts of the experiment—namely,

Pertetrasulphuric acid.....$SO_3 : O = 4 : 1$.
Pedisulphuric acid.....$SO_3 : O = 2 : 1$.
Peranhydrosulphuric acid (Caro's)...$SO_3 : O = 1 : 1$.

The Experiments.—In carrying out his experiments, Mr. Cook nearly neutralised solutions of Caro's acid by means of a carbonate, and then neutralised the liquid by means of either sulphuric acid or caustic soda, portions being taken out and tested with methyl orange. Measured portions of the neutral solution were run as quickly as possible into flasks containing a little dilute H_2SO_4 to assist decomposition; the persulphuric acids were then estimated by Baezer and Villiger's method. Portions of the same solution were heated at 100° until all oxidising power was lost, and the acidity developed was estimated by caustic soda, methyl orange being used as an indicator.

Examination of CO_2 in Atmospheric Air.—At the Municipal Observatory of Montsouris the quantitative examination of atmospheric air has been carried out for a period of twenty-five years. About six years ago some special researches were commenced, under the direction of M. Albert Lévy, by MM. Henriet and Pécoul, the first results of which were presented to the Academy of Sciences in 1898. The fact was announced that atmospheric air which had been perfectly freed from carbon dioxide by an exhaustive treatment with potash and baryta, on circulating repeatedly by means of a mercury circulator through a fresh quantity of baryta, gave appreciable amounts of barium carbonate corresponding to the production of amounts of carbon dioxide of an order nearly approaching, in some cases, the amount of carbon dioxide originally in the air. These facts were so extraordinary that the Academy appointed a commission, consisting of MM. Armand Gautier, Haller, and Ad. Carnot, to repeat and report on this work. Their report is published in the current number of the *Comptes rendus*, and they confirm in every particular the views originally stated by MM. Henriet and Pécoul. M. Henriet also publishes in the same number an account of an attempt made to determine the nature of the gaseous substance present in the air capable of giving these results, and comes to the conclusion that there is present in the air of Paris the vapour of a substituted formamide, the slow hydrolysis of which by the baryta furnishes the carbon dioxide originally found.

New Researches on Liquid Silicon Hydride, Si_2H_6.—H. Moissan and S. Smiles.—In a previous paper the authors published an account of the preparation and some of the properties of liquid silicon hydride, Si_2H_6. They have continued this research, and give further proof of the formula Si_2H_6. This silicide corresponds to ethane; it is spontaneously inflammable in presence of air, and possesses very energetic reducing properties. It decomposes carbon tetrachloride and sulphur hexafluoride with violence.

Certain Properties of Amorphous Silicon.—H. Moissan and S. Smiles.—When the vapour of liquid hydrogen silicide is decomposed by a series of induction-sparks, hydrogen and silicon are obtained. This silicon is in a finely-divided state, and slowly reduces a neutral solution of potassium permanganate at ordinary temperatures. This reduction becomes more rapid at 100°. Various other reductions are effected by silicon prepared in this manner.

THE Rev. U. Z. Rule has prepared *Graduated Lessons on the Old Testament*, which will be issued in three small volumes for school use by the Oxford University Press early next month. The work has been edited by the Rev. Ll. J. M. Bebb, principal of St. David's College, Lampeter. Mr. Rule has followed the text of the Revised Version, and has called special attention to the moral and religious lessons which may be drawn from the history.

THEORETICAL MECHANICS.

(ADVANCED AND HONOURS STAGES.)

BY F. CASTLE, M.I.M.E.,

Royal College of Science; Lecturer on Mechanics, Geometry, etc., Morley College, London; Author of "Elementary Practical Physics," "Practical Mathematics," etc.

IT is proposed to give as much help as space will permit to those who intend to take the examinations in Theoretical Mechanics, "Solids and Fluids." An attempt will be made to cover the main points as outlined in the syllabus of each subject. As it is probable that the majority of our readers are concerned with the advanced stages, the major portion will consist of work arranged for such students, the remaining portions for those who may be interested in the honours stages. It is obviously of the utmost importance to all students that the earlier work should be well prepared. This more particularly applies to numerical exercise work. Inability to solve fairly easy or even somewhat difficult questions is the primary cause of failures and disappointment in this and in other subjects.

It is not suggested that tedious arithmetical processes should be carried out at great length, but, using four-figure logarithms, the processes referred to present no difficulty, and instead of leaving a question in an unfinished state, and in many cases incorrect, its numerical value may readily be obtained.

It is not necessary to refer to the items in the syllabus of each subject. Part II. of the *Directory* can be obtained at the cost of a few pence, and all the necessary information obtained from it.

The elementary portions of the subject may readily be obtained from any text-book on the subject, hence only the more important portions will be considered at as great length as space will permit. These will be followed by the solutions of a number of typical questions, chiefly selected from previous examination papers. Probably these will be found to be very serviceable to those who find themselves unable to attack with any hope of success the questions given.

In attempting to clear away some of the difficulties usually met with in the more important sections, it is possible that other portions may not receive sufficient attention. If this should be the case, the Editor will be glad to receive suggestions from any reader with a view of making these "Notes" a real help to those using them.

Definitions.—A student supposed to be acquainted with the elementary part of the subject might reasonably be assumed to be familiar with the definitions, and what the terms imply; but this is frequently not the case, and is no doubt due to the inelastic method adopted in many of the text-books on the subject. Thus a *particle* is defined as a material point, or else as a portion of matter the dimensions of which are indefinitely small in all directions, and therefore its volume indefinitely small. Such definitions, although correct, do not give much aid to a student who finds in the data of a question that a particle has a mass of 20 lbs., or, again, that the earth itself may be considered as a mere particle moving in a vast curve about the sun. It would be much better to assume the word particle to include any body of comparatively small size in which the motion of one point of it is alone considered—that is, the motion of its centre of gravity. When this is done in questions on kinetic energy or momentum, the velocity of its centre of gravity is considered, and no motion it may have about its own axis is taken into account.

Again, a *rigid body*, defined as an ideal conception not occurring in nature, is better looked upon, not necessarily as a body unchanged in shape, but one in which no change in the parts of the body occur during the interval of time considered.

Rate.—It is important that the meaning of the word rate should be clearly made out. Thus the rate of change of position of a moving body is called its *speed*, or, usually, its velocity. It should be noticed that velocity is a *vector*, and therefore implies direction. Thus a velocity of 4 feet per second, in which no direction is given, is better described as a *speed* of 4 feet per second. As, however, the word velocity is almost invariably used, it may be useful to retain it in these "Notes."

Rate of increase of velocity per unit time is called *acceleration*, *rate of decrease* may be called either *retardation* or *negative acceleration*. It would therefore be incorrect to refer to an acceleration of 4 feet per sec.; it should be 4 ft. per sec. per sec.

A body is said to move with *uniform velocity* when the same time is always taken to move over the same distance, and with *variable velocity* when it does not move always through the same distance in the same time. This is expressed by $v = \frac{s}{t}$, or $s = vt$, when v is the velocity and s the space described in a time t.

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In the case of variable velocity, the *average* velocity at any place can be found by dividing the small space described in a small interval of time by the time. This may be written

$$v = \frac{\delta s}{\delta t}.$$

The fundamental equation of dynamics as given in Newton's second law of motion must be clearly made out. The law may be written $F = mf$ (1), where F denotes the force and f the acceleration produced in a body of mass m.

When any two of the three terms are given, the remaining term may be obtained.

From (1) it is obvious (*a*) *constant force produces constant acceleration*; (*b*) *no acceleration in any direction indicates that there is no force in any direction.* Again from (1), $f = \frac{F}{m}$, from which, given the force and the mass, the acceleration can be found. Multiplying Eq. (1) by t, we obtain the equation

$$Ft = mft = mv. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The product Ft is called the *impulse of a force*, or the *time-action of a force*, and is *measured by the momentum generated.* The change of momentum in a time t may be written

$$Ft = m(v_1 - v). \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

It will be noticed that (1) is at once obtained from (3) when t is unity (or one second). Also average velocity = (space) ÷ time.

$$\therefore \frac{v_1 + v}{2} = \frac{s}{t}. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Multiply equations (4) and (3) together, and we obtain

$$Fs = \tfrac{1}{2}m(v_1^2 - v^2), \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (5)$$

the well-known formula for kinetic energy or space-action of a force.

The proofs of formulæ just referred to are usually all that an elementary student requires, but those who have even a slight acquaintance with the calculus may obtain these and others in a much more direct manner.

Thus, with the usual notation δt, δv, and δs for small increments of time, velocity, and space respectively, we may write (3) in the form

$$F = m\frac{\delta v}{\delta t} = m\frac{\delta^2 s}{\delta t^2}.$$

The work done by a force F through a space δs is

$$F\delta s = m\frac{\delta v}{\delta t}\delta s; \text{ but } \frac{\delta s}{\delta t} = v.$$

$\therefore F\delta s = mv\delta v$, and the integral gives $Fs = \frac{1}{2}mv^2 + C$.

If, when $s = 0$, $v = 0$, then $C = 0$, and the equation becomes $Fs = \frac{1}{2}mv^2$.

Also, as $\frac{dv}{dt}$ or $\frac{d^2s}{dt^2} = f$, $\therefore \frac{ds}{dt}$ or $v = ft + C$.

If, when t is 0, the velocity is V, then $C = V$. $\therefore v = V + ft$.

Again, from $\frac{ds}{dt} = V + ft$, we find $s = Vt + \frac{1}{2}ft^2 + C$.

If, when t is 0, s is 0, then $C = 0$. $\therefore s = Vt + \frac{1}{2}ft^2$.

It will be noticed that a positive acceleration has been assumed; but the results are the same, with a change of sign, when negative acceleration is assumed.

As the results hold for any value of f, we may write g for f, and equations applicable to falling bodies are obtained.

The fundamental equation $F = mf$ has so many important applications that it is a difficult matter to even make a selection. As an example, suppose a body of weight W is placed on the floor of a lift, which may be made to rise or fall with an acceleration of f feet per sec. per sec. Then, if N is the normal pressure between the body and the surface on which it rests, the resulting downward force on W, when the lift is moving downwards, is given by $\frac{W - N}{W} = \frac{f}{g}$.

If the lift is moving upwards, we have $\frac{N - W}{W} = \frac{f}{g}$, and the value of N in each case can be found when W and f are given.

Combining the two equations, we have

$$N = W\left(1 \pm \frac{f}{g}\right). \quad . \quad . \quad . \quad . \quad . \quad (6)$$

From (6), if $f = g$, then, when the lift is moving upwards, the value of N is 2W, when downwards, N is 0.

Similarly, if T denotes the tension of a rope or coil supporting a weight W, then, when lowered with acceleration f, the equation $F = mf$ gives $W - T = \frac{W}{g}f$. $\therefore T = W\left(1 - \frac{f}{g}\right)$.

Ex. 1. A mass of 12 lbs. is attached to a string which is held in the hand. If the hand be lowered with uniform acceleration of 10 feet per second per second, what is the force tending to stretch the string? (1902.)

Here, if T denote the tension in the string, then, when the system is at rest, T is 12 lbs.; when moving downwards with an acceleration of 10 feet per sec. per sec., the value of T is given by

$$12\left(1 - \frac{10}{32}\right). \quad \therefore T = \frac{12 \times 22}{32} = \frac{33}{4} = 8\tfrac{1}{4} \text{ lbs.}$$

Or, from the fundamental relation, force = mass × acceleration. The force necessary to give an acceleration of 10 feet per sec. per sec. is $F = \frac{12}{32} \times 10 = \frac{120}{8}$. Hence the force or tension in the string will be $12 - \frac{120}{8} = \frac{264}{32}$.

$\therefore$ tension in string = $8\frac{1}{4}$ lbs.

Ex. 2. A shot, 1300 lbs., moving at 1730 feet per second, strikes a fixed target. How far will the shot penetrate if the average resistance to penetration be 13560 tons weight? (1902.)

In the equation $F \times s = \frac{1}{2}mv^2$. F is given in poundals when m is in pounds. F is given in tons when the right-hand side is divided by g and by 2240.

$$\therefore 13500 \times s = \frac{1300 \times (1730)^2}{64 \times 2240}.$$

$$\therefore s = \frac{1300 \times (1730)^2}{64 \times 2240 \times 13500} = \underline{2{\cdot}005 \text{ feet.}}$$

Ex. 3. Show that $v^2 = u^2 + 2fs$.

The mass of a particle is $3\frac{1}{2}$ lb., and its velocity changes from 15 to 35 feet a second while it describes a distance of 25 feet. Find the force which produces the change, and how many foot-poundals of work it does in producing the change. (1901.)

Ans. 70, 1750.

Hint.—$F \times 25 = \frac{1}{2} \times 3{\cdot}5(35^2 - 15^2)$.

$$\therefore F = \frac{50 \times 20 \times 7}{4 \times 25} = 70 \text{ poundals.}$$

Probably one or more of the following books will be found suitable:—Advanced Stage: *Fluids.—Hydrostatics and Pneumatics*, by Pinkerton (Blackie); *Elementary Hydrostatics*, by Besant (Deighton, Bell, and Co.). *Solids and Fluids.*—Minchin's *Statics*, Part I. (Clarendon Press); Minchin's *Elementary Hydrostatics and Kinetics* (Clarendon Press); Minchin's *The Student's Dynamics* (George Bell and Sons).

ELECTRICITY AND MAGNETISM.

(ADVANCED AND HONOURS STAGES.)

BY EDWIN EDSER, A.R.C.S., F.PH.S.

Grouping of Cells.—In arranging the details of laboratory experiments, it frequently becomes necessary to arrange a given number of similar cells in such a manner that the greatest possible current is produced in a circuit comprising a constant resistance external to the cells. For instance, it may be required to excite an electro-magnet as strongly as possible, using a given set of cells. The student may find the following notes of assistance in making clearer the reasons which must guide him in such circumstances.

The whole of the cells may be connected in series with the external resistance; or the cells may be arranged in a number of groups, each group consisting of the same number of cells arranged in series, all of these groups being then arranged in parallel; or all of the cells may be arranged in parallel.

Let us suppose that the total number of similar cells at our disposal is equal to N, and that these cells are arranged in n groups, each group consisting of m cells in series, the n groups being finally connected in parallel. Then $mn = N$. Let E be the E.M.F. of each cell, while the resistance of each cell is equal to r, the resistance of the external circuit through which the current is to flow being equal to R.

Since, in passing through the battery, we must traverse m cells in series, it follows that the E.M.F. of the battery is equal to mE. The resistance of m cells in series is equal to mr; and since the battery consists of n groups (each having a resistance equal to mr), arranged in parallel, it follows that the resistance of the battery as a whole is equal to

$$\frac{mr}{n}.$$

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Thus the total resistance of the circuit, including battery, leads, and instruments, etc., is equal to

$$\frac{mr}{n} + R,$$

and the current C in the circuit is given by the equation

$$C = \frac{mE}{\frac{mr}{n} + R} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1).$$

The problem before us is to determine, among the various possible values of m and n, those which give C in (1) the greatest possible value.

Since $mn = N$, $m = \frac{N}{n}$. . Substituting in (1), we obtain

$$C = \frac{\frac{N}{n}E}{\frac{Nr}{n^2} + R}.$$

$$\therefore C = \frac{NE}{\frac{Nr}{n} + nR} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2).$$

Since we are supposed to have only a certain number N of cells at our disposal, and all of these cells are to be used, N is constant, and therefore NE, the numerator of (2), is constant. To give C the largest possible value, *we must find the value of* n, *which will make the denominator of* (2) *as small as possible.*

Let n_1 be the value of n, which gives the denominator of (2) the smallest possible value. Then, if n' is the next value of n *higher* than n_1 which it is possible to obtain with the given set of cells, this value must give the denominator of (2) a greater value than that given by n_1. Thus—

$$\left(\frac{Nr}{n'} + n'R\right) > \left(\frac{Nr}{n_1} + n_1R\right).$$

$$\therefore Nr\left(\frac{1}{n_1} - \frac{1}{n'}\right) = \frac{Nr(n' - n_1)}{n_1n'} < (n' - n_1)R.$$

$$\therefore \frac{Nr}{n_1n'} < R \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3).$$

Also, since $n_1 < n'$, $\frac{Nr}{(n')^2} < R$.

Let n'' be the next value of n *less* than n_1 which it is possible to obtain with the given set of cells. Then this value of n must give the denominator of (2) a greater value than that given by n_1. Consequently—

$$\left(\frac{Nr}{n''} + n''R\right) > \left(\frac{Nr}{n_1} + n_1R\right).$$

$$\therefore Nr\left(\frac{1}{n''} - \frac{1}{n_1}\right) = \frac{Nr(n_1 - n'')}{n_1n''} > (n_1 - n'')R.$$

$$\therefore \frac{Nr}{n_1n''} > R \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4).$$

Also, $\frac{Nr}{(n'')^2} > R$.

Now n_1 is intermediate in value between n' and n'', being less than the former and greater than the latter. Thus n_1^2 will be intermediate in value between $(n')^2$ and $(n'')^2$, being smaller than the former and greater than the latter. Consequently—

$$\frac{Nr}{(n')^2} < \frac{Nr}{n_1^2} < \frac{Nr}{(n'')^2}.$$

We thus see that R is intermediate in value between $\frac{Nr}{(n')^2}$ and $\frac{Nr}{(n'')^2}$, while $\frac{Nr}{n_1^2}$ is intermediate in value between the same quantities.

Consequently $\frac{Nr}{n_1^2}$ will be more nearly equal to R than either $\frac{Nr}{(n')^2}$ or $\frac{Nr}{(n'')^2}$. But $\frac{Nr}{n^2}$ is the value of the resistance of the battery when the latter comprises n groups in parallel (compare (1) and (2) above). Thus we arrive at the law, that **in order to arrange a given set of cells in the form of a battery which shall produce the greatest possible current, we must make the resistance of the battery as nearly as possible equal to that of the external circuit.**

If the external resistance of the circuit is very great in comparison with the resistance of a cell, we must arrange the cells in series, so as to make their combined resistance as great as possible. If, on the other hand, the external resistance is very small, we must arrange all the cells in parallel.

Problem.—The resistance of an electro-magnet is 10 ohms, and it is required to excite it as strongly as possible by means of 60 similar cells, each having an internal resistance of 1 ohm. How should the cells be arranged?

$60 = 5 \times 3 \times 2 \times 2$. Thus, in (2), we can give n the values 60, 30, 20, 15, 10, 6, 5, 4, 3, or 2. We must make $\frac{Nr}{n^2} = \frac{60 \times 1}{n^2}$ as nearly as possible equal to 10. If $n = 2$, we obtain the value 15; when $n = 3$, we obtain the value 6·4. Hence the best arrangement will correspond to 3 parallel groups, each comprising 20 cells.

Problem.—What is the smallest number of cells (each possessing an E.M.F. of 2 volts, and an internal resistance of 4 ohms) which can be used to produce a current of about 1 ampere when the external resistance amounts to 15 ohms?

When the number of cells has been settled, they must obviously be arranged so as to give the greatest possible current. Thus the resistance of the battery must be equal, as nearly as possible, to that of the external circuit, or the total resistance of the circuit must be equal to $2 \times 15 = 30$ ohms. Thus, if E is the E.M.F. of the battery,

$$\frac{E}{30} = 1. \quad \therefore E = 30.$$

We shall require 15 cells in series in order to produce a resultant E.M.F. of 30 volts.

Let n be the number of parallel groups. Then, in order that the internal resistance of the battery shall be equal to 15 ohms, we must have—

$$\frac{15 \times 4}{n} = 15.$$

$$\therefore n = 4.$$

Thus we require 60 cells, arranged in 4 parallel groups, each group comprising 15 cells.

Problem.—You are required to use the smallest possible number of Daniell cells (E.M.F. = 1 volt, internal resistance = 2 ohms) in order to obtain a current of 5 amperes, the external resistance of the circuit being equal to 3 ohms. What arrangements would you make?

Ans. 20 parallel groups, each comprising 30 Daniell cells.

It must be remembered that in the above investigation we have merely sought for the arrangement of a given set of cells which will produce the greatest possible current. The economy of the arrangement has not yet been considered. It is plain, however, that from an economical point of view the above arrangement is very bad. For if C is the current, and R the external resistance, then the energy used up in the external circuit is equal to C^2R, while an equal amount of energy is expended in the battery. Thus we only utilise, in the external circuit, one-half of the total energy produced, and the efficiency of the arrangement is equal to 50 per cent.

To obtain the most efficient arrangement, we must make the internal resistance of the battery as small as possible in comparison with the external resistance. Thus there will be a greater economy when all of the cells are arranged in parallel than under any other arrangement.

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Der Bibliothekar: Schwank in 4 Akten. Von Gustav von Moser. Edited, with introduction, notes, and vocabulary, by William A. Cooper, A.M., Assistant Professor of German in the Leland Stanford Junior University. In its English adaptation as *The Private Secretary*, the irresistible humour of this play is familiar to many. The selection of such a work for a German reading-book is more than a sugar coating of the inevitable pill. The bright, modern dialogue, full of idiomatic forms, is itself one of the best means of giving pupils a command of the language, conversationally as well as grammatically. The stimulus of interest is here in full measure. A class will take its German very seriously indeed if the broad humour of this play does not lighten the task of translation until it becomes no longer a task, but a pleasure. The work of the editor and of the publisher is excellent.

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"(*a*) What a bud as a whole is.

"(*b*) What the reason for its formation is.

"(*c*) What rudiments of future growth are present.

"(*d*) How nearly these approach the full-grown condition as to form.

"(*e*) What parts are merely of temporary use.

"(*f*) What the morphology of these parts is."

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A Constructive Form Work in Elementary Geometry. By Dr. Hailman, U.S.A. We really cannot follow Dr. Hailman through this book, nor see clearly what the object of it is. The purpose is said to be "to develop clear geometrical notions, to give skill in accurate construction, to cultivate a healthy æsthetic feeling," etc.; but the exercises shown do not seem calculated to secure these ends. In common, too, with many American books, there seems to be no continuity of idea. A little geometry, a little colouring, and a little cardboard work go to make up the book under notice, but neither branch is carried far enough to be of any use.

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Waverley. A very good contracted edition of Scott's novel, edited by Miss Smith of Bolton High School for Girls. Preceding the text of the novel there is a remarkably well-written introduction, which, unlike some introductions, should be read *before* the story is commenced. Useful notes, too, are added, which deal with the meanings of uncommon words and words which are distinctly Scotch. The book should do much to give boys a desire for a continuous story, and draw them from scraps which are of no educational value. This is one of the aims of the book, and it is well carried out.

Men of Renown. By John Finnemore. We had pleasure a few months ago in noticing a reader entitled *Famous Englishmen*, and we pointed out the advantages of a course of history which dealt with the men who have been instrumental in building up our great empire. The book under review is a new edition of this work, but whereas *Famous Englishmen* dealt with the task in two volumes, *Men of Renown* accomplishes the lessons in one. The biographical method of teaching history centres

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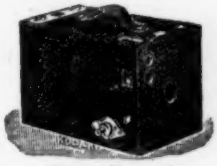

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Descriptive Geography from Original Sources: Central and South America, with the West Indies. By F. D. and A. J. Herbertson. It is a fine thing for our children that the old method of teaching geography, which largely consisted of cramming the memory with names of this, that, and the other, is fast dying out. This book, and the series to which it belongs, should do much to hasten the completion of the new order of things. It consists of accounts by travellers who have actually seen the places which are described, and it is so well edited that much time and labour must have been bestowed upon it. The selection, the condensation, and the references are admirable. There is an excellent introduction, which summarises the chief facts of the geography of the countries dealt with, and a complete index, which facilitates the task of referring to the works of the authors themselves. No pains have been spared in making the book useful for widening the knowledge of the reader, and the illustrations have been splendidly chosen and executed. The book should at least be found in every school library.

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The Picture Shakespeare: Merchant of Venice. As the name implies, the chief feature of this issue is the use of pictures to illustrate the text. This undoubtedly adds to the value of the book as a reader for young people. The notes, etc., are practically the same as in the *Junior School Shakespeare*, which we have noticed on several previous occasions.

Cardboard Modelling. By A. W. Bevis. The system advocated by Mr. Bevis is ingenious, but that is about all that can be said for it. Doubtless when the subject is first commenced it may be advantageous to do without gum or paste, but this is questionable later on. Should it not be an integral part of cardboard modelling to teach the pupil how to use gum and paste? Doing without these places great restriction on the character of the models made, as will be seen by the illustrations in the book. Further, when the models are made they are very fragile, and many of them very ugly too.

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The World of Animal Life. Edited by Fred Smith. In such a wide subject as this the selection of matter presents no small difficulty. The plan generally adopted by modern naturalists is to give as full a description as possible of a few prominent types, and this was evidently the intention of the editor, who states that his aim is to deal with those creatures "with whose names we are all familiar;" but we cannot help feeling that he has been tempted to include rather too many. This, however, is quite a matter of opinion. The treatment is thorough, and the language plain, and, without thrusting the principles of zoological classification to the front, the writer has arranged the descriptions in a sequence which depends upon classification, and which, as it were, prepares the way for a study of it. The book is beautifully got up and illustrated, and would make a suitable prize or a useful addition to a school library.

Browning's "Strafford." Edited by Agnes Wilson. (Blackie's English Classics.) There is, we fear, something more than a merely "alleged obscurity" in Browning's poetry—an obscurity which for a time limited the number of his readers, but which many lecturers and essayists besides Mr. Birrell have set themselves to lighten. The foreign and unfamiliar setting of many of the poems is no doubt one cause of the difficulty, but another, paradoxical as it may sound, seems to lie in their very dramatic qualities. For whether or not the form be dramatic, the style is almost always so. But instead of the flowing sequence of "Marlowe's mighty line," which, so to say, reads itself, we find in Browning the unfinished sentence and the interrupted thought just, if we think of it, as they occur in real converse and discussion. In "Strafford," which Miss Agnes Wilson has so ably edited for Messrs. Blackie, we do not meet with the first difficulty—the subject being taken from what is perhaps the best known and most interesting period of our own history. The facts, however, are adapted for the purposes of the drama: Strafford's zeal for his ideal of monarchical government is changed, in spite of Charles's utter want of "straightness," into a personal devotion to the king himself. This point, as well as that of the respective relations of Strafford to Pym and to Lady Carlisle, is fully discussed in an admirable introduction, which also includes historical sketches of the several characters of the play. The notes to this edition are illuminating without being out of proportion to the text.

Macaulay's Lives of Johnson and Goldsmith. Edited by John Downie, M.A. (Blackie's English Classics.) This is another addition to Blackie's admirable series of English Classics. It is not the first of the volumes in which Macaulay has been laid under contribution, some of the famous essays having been previously dealt with by the same editor. But we venture to think it is a selection which does more justice to the author than some of its predecessors. For if the subject-matter lack the exciting elements of certain of the historical essays, the style in which it is presented is much more worthy of imitation, though perhaps more inimitable. In addition to a brief sketch of the main facts of Macaulay's career, the editor gives, in his introduction, a criticism of the *Lives*, and a most interesting and suggestive analysis of "Macaulayese," in which its defects are not more extenuated than its merits are enforced. As is necessary in editing a writer so allusive as Macaulay, the notes are very full, and cannot fail to be of great assistance to the literary student.

Cæsar's Gallic War. Book VI. (Blackie's Illustrated Latin Series.) By John Brown, B.A. A short time ago we had the pleasure of speaking very highly indeed of Professor Brown's edition of *Cæsar's Gallic War*, Book III., belonging to this series. Book VI. is in no way inferior in soundness, completeness, and general interest to Book III., and we do not think that higher praise could be given to a Latin text-book than to say this.

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Lamb: Select Essays. Edited by Agnes Wilson. It is given to but few men to succeed in both poetry and prose, and Lamb was no exception to the rule. Lamb's poems, despite the praises of his poetical friends, are now seldom read, and his dramatic attempts were complete failures. But wherever the English language is spoken his "Essays" will be appreciated, and his "Tales from Shakespeare" will interest the young pupil and stimulate him to the study of the great dramatist. The volume before us contains twenty-one of the essays, carefully selected, and including those on "Christ's Hospital," "Mackery End," and "Poor Relations," which deal with the writer's personal surroundings, "On the Tragedies of Shakespeare," and "Books and Reading," which show his powers of literary criticism, and others dealing with social questions; while the whole illustrate his versatility, his elegant prose style, and his quiet humour. In no case is a knowledge of the writer more necessary in order to fully appreciate his work than in the case of Lamb; and the editor has written a delightful introduction, to give us an idea of the nature and character of this noble, self-sacrificing man. The book is in every way suitable for introduction into schools in which an effort is made to study the masterpieces of English prose.

Selections from Wordsworth, Coleridge, and Keats. How few of the pupils from English schools of any kind show a love of poetry in after life! The reason, we think, is not far to seek. Time tables may provide for the study of literature, but alas, as the pupils have to pass the test of an examination, the teacher devotes the greater part of his time to seeing that the notes dealing with grammatical irregularities, and other points that the examiner delights in, are properly prepared. The appearance of this volume seems to be a protest against this condition of things. The poems selected are representative of the three poets; are well within the reach of the junior student; and, if studied for the sake of their poetic beauty, should kindle a love for poetry that will lead the pupil to seek for pleasure in the study of poetry in after life. The short introduction will do much towards making the student understand the characteristics of true poetry in general, and of the writings of Wordsworth, Coleridge, and Keats in particular.

Pope's Rape of the Lock and other Poems. Edited by George Soutar. This volume is not within the powers of the young pupils who can profit by the preceding; indeed, we think that none but an advanced student should attempt a long, unbroken study of Pope's works. The very regularity of the verse becomes monotonous, the epigrammatic structure of the sentences loses its charm, and the critical and philosophical nature of the subject-matter puts a great strain on the student's powers. The difficulty of the task is shown by the fact that the number of pages devoted to explanatory matter is greater than the number occupied by the text, and yet we cannot say that the notes are at all too full. The editor has shown great judgment both in the selection of typical poems and in their annotation, and the student whose literary studies are sufficiently advanced to take up Pope will do well to familiarise himself with the contents of this volume.

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Nature Lessons with the Blackboard. By F. F. Lydon. Seeing the attention that is just now being given to nature study, both as a subject in itself and in connection with drawing, Mr Lydon's book appears at an opportune moment. It is very complete, and copiously illustrated. The main divisions treated of are plant life, animal life, and, most important for teaching purposes, the comparison of animals. The drawings are exceedingly clear and well executed, without over elaboration. A most valuable book for any teacher.

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Familiar Wild Flowers. By F. E. Hulme. It is almost unnecessary to introduce this work to the notice of our readers; it must be known to most of them. At the present time, however, great attention is being paid to nature study as a branch of education, and Mr. Hulme's exhaustive treatise on wild flowers should be of great service in this respect. The illustrations are clearly and faithfully drawn. This we have proved by actual experience recently, and by its aid have been able to identify many wild flowers, the names of which were previously unknown. But apart from the educational value of the series, the knowledge gained adds much interest to our rambles in the country. What may be only an aimless wander, almost to boredom, becomes full of interest and enjoyment.

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Design: The Principles and Practice of the Making of Patterns. By Richard G. Hatton. With the number of books that have been put out during recent times, it would seem almost impossible to say anything new on this subject. Mr. Hatton, however, has not only found something new to say, but has said it well too. Though the book naturally has to treat of the fundamental principles of design, yet the various sections are dealt with in such an original and practical manner that it really all seems fresh. The wealth of illustrations, the clearness of the text, the practical working hints, all conduce to make the book most valuable for any art student, and one of the best in the market. We recommend it with the utmost cordiality.

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Arithmetic. By R. Hargreaves, M.A. Pp. vi + 416. Yet another arithmetic to compete for the favour of the schoolmaster! Mr. Hargreaves' work is thoroughly good, and worthy to be compared with the best. It follows well-established lines, and contains no startling innovations. Every subject commonly included is to be found here (including scales of notation and elementary mensuration), and each subject is illustrated by a large collection of questions, many of them new, and some of them, especially in the domain of pure number, of considerable originality. Some five hundred miscellaneous questions are appended, arranged in short examination papers, and also one hundred problems. In subtraction the method of complementary addition is given as an alternative. In multiplication the pupil is allowed to slope either to right or to left. No slavish fear of algebraical—that is, literal—symbols is felt, and a's and x's are freely introduced for the statement of a general law. The "Italian" method is recommended in division, rather more strongly than we are ourselves inclined to do, and generally adopted in examples worked in the text. An interesting section on recurring decimals states their laws much more accurately than is usual. Fermat's theorem is proved by an illustrative example. Horner's method is not given for cube root. There are occasional novelties of treatment. For instance, £883, 11s. 4d. $\times$ 29 $\div$ 208 is worked by multiplying first by 29, *without reducing* the s. and d., getting £7947, 319s. 116d., and then dividing by 208. A pretty mnemonic, new to us, is given for calculating the day of the week of any day of the month when we know the day of the week for any other day of any other month.

The book is generally very accurate, as far as the text is concerned. We have not tested the examples; for in a book containing, we should suppose, seven to ten thousand of such, the only test worth having is that of class-work. The statement at the top of page 107 is not quite accurate. No general law is given, but the student is led to infer that if D be a prime number such that 1/D has a period of p figures, $1/D^2$ will have a period of pD figures, $1/D^3$ of pD^2 figures, and so on. This is *generally* the case; but besides the exceptions 2 and 5, there is that of 3, which ought to have been mentioned, and 487, which is not generally known. It is a curious fact that 1/487 and $1/487^2$ have *both* a period of 486 figures. The statements made about apothecaries' weight are not quite correct. The apothecaries' ounce is now the same as the ounce avoirdupois, of 437½ grains. The ounce of 480 grains has been abandoned. Even the pharmacopœia of 1885 does not recognise the scruple and the drachm, Bruce, in his *Materia Medica and Therapeutics* (Cassell, 1886), writes as follows: "It is very common, although not official, to employ a weight between the grain and the ounce, for the sake of convenience, called the drachm, to signify 60 grains; *not, let it be observed, the eighth part of an ounce as in the fluid measures.* A 20-grain weight, called the scruple, was formerly in general use, but is now mostly discarded." We give this extract because of the general confusion which prevails upon this subject. The *only* legal apothecaries' weight is—

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We do not think the book so well fitted for the private student as it is for class use. The explanations are sometimes too concise to be quite intelligible. The last proof on page 70 (that the product of r consecutive numbers is divisible by the product of the first r consecutive numbers) is a case in point. But we congratulate Mr. Hargreaves on an admirable piece of work.

We cannot congratulate the publishers. The type is good and clear, though there is scarcely variety enough to please us. But the paper is atrocious. It appears to be of the kind that is sold for papering kitchen shelves! Surely Mr. Hargreaves might have been sent into a censorious world better dressed!

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The Story of Washington. By Jessie R. Smith. As a supplementary reader we cannot recommend the adoption of this book. It is true that the story is a popular one, and is told in a remarkably simple way. Its moral teaching, too, will appeal to the instincts of a young child; but its Americanisms, such as, "I guess it isn't sharp enough," "He went around cutting everything," "We won't have to wash them," are not desirable expressions for our English children either to read or imitate. In America, of course, things would be altogether different. There is one feature of the book that is very laudable; but here again it is open to question whether such introductions are beneficial. The feature referred to is this: the book is illustrated by means of imaginative drawings done by children of eleven, twelve, and thirteen years of age; the idea being that such drawings will be more attractive to children than would the drawings done by more accomplished artists. This is all very well in a way. The drawings, for children of this age, are exceedingly well done, but they are crude and inartistic. Men in the foreground are represented as being smaller than men in the background, soldiers wear helmets or shakos, or whatever they are, as big as their bodies, and so on. It would be equally as wrong educationally—and the principle is the same—to print the exercises in composition we get from our upper standard children and palm them off in reading books as reading lessons. In our reviews we have to watch over the interests of the children, and we do not think we shall be doing them a service if we allow such a book as this to come into their hands without pointing out what we think are defects. There is a preface to the book which is well worth reading. It deals with reading matter for young children, and with its points we cordially agree.

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Kleider machen Leute. Von Gottfried Keller. Edited by M. B. Lambert. (Heath's Modern Language Series.) This is an excellent book for the series in which it appears, and the humour of many of the scenes will give a zest to the labour of translation. The "helps" offered by the editor include a luminous biographical and critical notice of the author, useful notes on the more idiomatic and obscure usages, and a full vocabulary.

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We have noticed two trifling misprints. "Formula 36" (p. 332) should have read "Formula 37." Further, "Briggean" is an unlawful adjective to form from Briggs. It would horrify the "cultured man" familiar with "the subjunctive mood in indirect discourse."

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The information on p. 61 is unnecessary, and not very accurate. It was not Adrian Metius, but the father of Adrian Metius, who gave the value of 355/113 for π. Moreover, if Gresham's evaluation to 100 places and Vega's 140 places are deserving of mention, why is not the same honour done to our great English calculator Shanks, who actually found 707 places?

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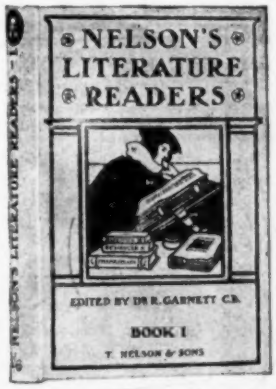

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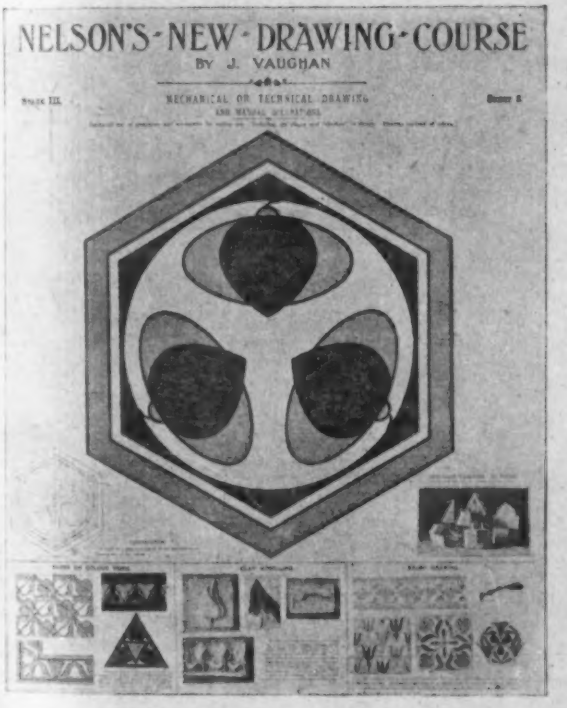

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